Aeronautica

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"Historical Associate" Grade of Membership Established by I.A.S.

A new grade of membership, known as "Historical Associate," has been established with the approval of the Council of the Institute in recognition of collectors and others interested in aeronautica and aeronautical history. The new grade is nonvoting, and dues of $10 per year include the quarterly publication of the Aeronautical Archives Committee. Age limit for Historical Members is 18 or over.

Fund Set Up—The Council set aside up to $4,500 for 12 months to service the new grade of Historical Associate. W. A. M. Burden, Chairman of the Aeronautical Archives Committee, explained that the budget provides for a full-time person stationed in the New York headquarters Museum to handle Museum attendance, inventory and cataloging, and details of proofreading and dummying in connection with the quarterly publication.

Through the new membership, it is planned to increase the historical holdings of the Archives without conflicting with the regular technical activities of the Institute.

Two Resolutions Passed—The I.A.S. Council, in approving the new membership grade, passed two resolutions as follows:

Resolved, that a new section be added to Article I of the By-Laws as follows: Historical Associate members shall be persons over 18 years of age interested in the history of aeronautics and related sciences, and the collection and preservation of historical aeronautical material. An applicant for this grade must submit proof of his interest and shall be recommended by three persons, one of whom shall be a member of the Institute. All applications must be approved by the Aeronautical Archives Committee. And be it further

Resolved, that the Director be authorized to expend up to $4,500 of Institute funds for a period of 12 months to service this grade of membership.

Members of the Institute will, as in the past, have available to them all present and future facilities of the Aeronautical Archives. Members are requested to assist in the support of this project by informing eligible individuals of the new grade of Historical Associate.

Re "Aeronautica"

This is the first issue of a new quarterly bulletin designed to serve the needs of the Historical Associate Members of the Institute. Future issues will contain articles of historical interest, as well as news of the activities of the members. For example, an early issue will contain an article on "Sixty Years of Experimental Super-Sonic Research," by Dr. Hugh L. Dryden, Director of Aeronautical Research, N.A.C.A.

Your comments and criticisms of Aeronautica are solicited. They should be mailed directly to Miss Claudine Lutz, care of the Institute, 2 East 64th St., New York 21, N.Y.

William A. M. Burden, Chairman, Aeronautical Archives Committee, and 1949 President, Institute of the Aeronautical Sciences

The Aeronautical Archives Committee

In the Summer and Fall of 1948, a growing interest on the part of a group of I.A.S. members in reactivating the activities of the Aeronautical Archives touched off a series of discussions which culminated in the establishment of the new grade of membership which is described above. To steer the activities of this group a new Archives Committee was appointed by the then I.A.S. President, John K. Northrop. The committee represents a group of people who, through the years, have been vitally interested in the preservation of historical aeronautical material and the dissemination of information on such matters to those members of the Institute, and others, who are of like mind.

The appointment of Mr. Burden as

Committee Chairman (made, by the way, some months before his election to the Presidency for 1949) is most appropriate in view of his long-standing interest in the historical and library collections of the Institute. The other members of the Committee are: P. R. Bassett, R. R. Dexter, A. E. Emil, R. H. Fleet, R. C. Gimbel, E. Hildes-Heim, J. J. Ide, C. S. Jones, S. P. Johnston, (Mrs.) Bella C. Landauer, Grover Loening, H. M. McCoy, G. A. Page, A. G. Renstrom, E. W. Robischon, and Howard Scholle. Miss Claudine Lutz will act as Secretary for the Committee.

The Landauer Collections

Outstanding among the Institute's collections of Aeronautica is the material that has been presented to us over the past years by Mrs. Bella C. Landauer. Her findings cover a wide range of historical interest. She has collected rare aeronautical prints of all countries, including several Japanese items dating from the mid-nineteenth century. Her library of sheet music, all on aeronautical themes, is unique. Other exhibits now on display on the Second Floor of the Institute include rare glass paintings, ceramics, jewelry, fabrics, clocks, medals, etc. The decorative motif in every case has some aeronautical theme.

Mrs. Landauer has long been connected with the New York Historical Society. She became interested in aeronautical collections many years ago when her son was first learning to fly. She has applied to her researches in aeronautica a broad knowledge of history, coupled with unbounded energy and a vivid curiosity. As a result of a long-time acquaintance with Major Gardner, the Institute has been the beneficiary of her work in the aeronautical field.

Mrs. Bella C. Landauer

The President's Message

Thanks to the energy of our first Executive Vice-President, Lester D. Gardner, and to the generosity of a number of friends of the Institute—notably, Mrs. Bella C. Landauer—the Institute possesses a unique collection of Aeronautica illustrating the development of aviation from man's first dreams of flight to the present day.

The Council of the Institute has been impressed by the growing interest in the history of aeronautics and in all forms of aeronautical collecting. Our wartime experiences have shown the potential value of such collections, and the special knowledge that collectors possess, to the intelligence aspects of our national defense.

Moved by these factors, the Council determined during the fall of last year to take steps that would enable more active use to be made of the Institute's collections by members of the Institute, and by others who, though interested in the field, are not now members and who may not possess the required technical knowledge to qualify them for regular membership.

With this in mind, the Council appropriated a small fund to provide for a full-time Curator for the Collections, for a modest quarterly publication devoted to worthwhile articles on aviation history, and for the provision of certain services of interest to collectors.

As Chairman of the revitalized Aeronautical Archives Committee, I would bespeak the cooperation of all members of the Institute who are interested in historical matters to help make this part of the Institute's varied activities the success it warrants.

W. A. M. Burden

The Henson Papers

43 70

One of the most unique and yet lesser-known items in the Institute's historical collections are the personal papers and other records of William Samuel Henson. Henson, it will be remembered, collaborated with John Stringfellow between 1842 and 1848 in building powered aircraft models (one of which eventually flew) and in the promotion of an air line to India using steam-powered air liners of Henson's design. Although Henson's work of that period is well documented, practically nothing has heretofore been known of his earlier life or of his subsequent history other than Hodgson's report in *The History of Aeronautics in Great Britain* that ". . . discouraged and impoverished . . . he crossed to America . . . and disappeared in the wilds of Texas from the ken of aeronautical science."

Now, however, thanks to Henson's own diary and other family records in the possession of the Institute, his life story is almost complete. Through a series of fortunate circumstances, in the course of a search for traces of Henson in America by the present Director of the Institute several years ago, these long-lost papers were discovered in the attic of the residence of Henson's own daughter, Mrs. George W. Lipsham, in Orange, N.J. They contain, among other items, his diary covering the period of his emigration to America; newspaper clippings, including a detailed obituary and history of his father and grandfather; his copy of the working agreement with Stringfellow; several letters from Stringfellow concerning the progress of their model work in 1845; many sketches and notes of subsequent Henson inventions, none of them aeronautical; and a host of other papers that shed light on the character of the man.

One of the most interesting items of Hensonia is his personal copy of John Wise's book, *A System of Aeronautics*, in which he made some rather caustic comments on the author's reporting of the "Aeriel" project of 1842–1848. This invaluable material was presented to the Institute by Henson's granddaughter, Miss Winifred Lipsham, and her father, George W. Lipsham.

Based on these data, the first definitive account of Henson's life was published in *The Technology Review* (Massachusetts Institute of Technology) in June, 1943, entitled "Grandfather of Flight." The article was illustrated with many facsimilies from Henson's notebooks, and included a copy of the only known Henson portrait, a photograph taken in Lima, Peru, circa 1866. This photograph is now in the Institute collections.

It has been suggested that extensive excerpts of the above article should be reprinted in some subsequent issue of Aeronautica. Permission to do so will be sought from the editors of *The Technology Review*. Meanwhile, certain of the Henson papers will be on display in the "First Century of Flight" Exhibit, which is referred to on this page. The entire collection may be seen by members by application to the Curator of the Archives.

Claudine Lutz, Archives Curator, and Institute Director, S. Paul Johnston, discussing plans for "First Century of Flight" Exhibit

First Century of Flight

Last year during the Institute's Annual Meeting, a special display of portraits of aviation's pioneers by Lewis Eugene Thompson was on view in the Aeronautical Museum. This year, for the same occasion, selected items from the Institute's collections have been assembled in a dynamic exhibit depicting aviation progress in the hundred years between the experiments of the mid-nineteenth century and the penetration of the Sonic Barrier by the Bell X-1.

It would be manifestly impossible to illustrate by model or by picture *every* step in the long and arduous trek through the First Century of Flight. An effort has been made, however, to highlight the significant stages and to emphasize the turning points that have brought us to the current level of development. The exhibit (moving clockwise from the entrance) begins with "The Grandfathers of Flight"—Henson, Stringfellow, Penaud, Lillienthal—through the preflight period of Langley and Chanute, to the Wrights. A long wall space carries the story along through two world wars to the machines of today. Dominating one end of the exhibit is a large chart of aeronautical progress from 1903 to 1960, with models of significant types mounted on the rising curve in chronological order. The final panel is devoted to the future, mounting Flying Wing models, Rocket Ships, and Helicopters.

The display is presented under the auspices of the Aeronautical Archives Committee. It was designed by Miss Claudine Lutz, Archives Curator, and constructed by members of the I.A.S. staff.

Claudine Lutz Appointed Archives Curator

As authorized by the Council and with the approval of the Archives Committee, on October 4, 1948, the Director appointed Miss Claudine Lutz to be Curator of the Archives and Secretary to the Archives Committee. She is now in charge of the collections in the New York headquarters building and is handling the promotion and organization of Historical Associate Memberships and the preparation of Aeronautica.

Miss Lutz was educated in France and Switzerland. She attended Sarah Lawrence College in Bronxville, N.Y., and received her B.A. in the field of History of Art and Literature from Barnard College in New York. Under a Barnard Fellowship she carried out a research project on eighteenth century silversmiths in Canada and has credits toward advanced degrees in Art at Columbia University. During the war she served for two years in the WAC. She has also had experience as a teacher and in the field of public relations. She has a long-standing interest in aeronautical history.

Since her arrival, Miss Lutz has been engaged in the development of an inventory and a new cataloging system for the Institute collections. She has also been active in planning the "First Century of Flight" exhibit and for other similar displays in the future.

Historical Footnote

While in Paris in 1939, Dr. George W. Lewis, then I.A.S. President, and Lester D. Gardner were invited by Mr. Hart O. Berg to inspect his collection of early aeronautical papers. As representative of the Wright Brothers during their negotiations with several foreign governments in the 1906–1910 period, Mr. Berg had amassed a trunkful of rare documents of great historical interest. These were turned over to Dr. Lewis who brought them back to the United States. Since such material did not properly belong in a library, it was suggested that the Institute might well become the repository of such historical collections by the formation of a new activity especially organized for the purpose. The suggestion was adopted by the Council, and the Aeronautical Archives of the Institute came into being in the course of the next year.

The Aeronautical Collections of the Institute

Few are aware of the widespread use that has been made of aeronautical motifs in art from the earliest days of air navigation. The Montgolfiers had scarcely demonstrated the practicability of the hot air balloon before French craftsmen began using the balloon theme in the decoration of china, jewelry, and furniture. Fabrics for dresses and draperies early showed the influence of the new science. Even clocks of the early nineteenth century were decorated with pictures of famous balloons.

The Institute is fortunate in having among its collections excellent examples of these art forms. The Landauer material includes early French, German, English, and American miniatures, porcelains, fans, powder boxes, and jewelry, all with aeronautical themes. The Burden-Tissandier Collections, now on loan to the Institute, contain many fine examples of late eighteenth century inlaid furniture illustrating some of the early flights of the great French balloonists. Some of the china and enamelware of this collection rank with the finest in the world.

Another important element of the I.A.S. Museum is the Harry F. Guggenheim print collection. It comprises many of the finest examples of eighteenth and nineteenth century English, French, and Italian prints, etchings, and engravings, all on aeronautical themes. Among the major artists represented are Cruishank, Rowlandson, and Daumier. In addition to accurate renditions of the famous early balloon ascensions which are of interest to the aeronautical historian, the collection includes a number of humorous items, cartoons, and satirical drawings that point up some of the political and social problems of the day.

A corner of the museum showing a part of the Guggenheim print collection

Another gold mine (and no pun is intended here) for the researcher in the aeronautical past is to be found in the Institute's extensive collection of medals. Almost every event of importance, from the first Montgolfier flight to the rescue of marooned aviators from the Greenland Ice Cap, has been commemorated by a medal of some sort. One aviation magazine recently published a short history of aviation based solely on photographs of some of the medals in the Institute's collections. This may well be a fertile field for the cultivation of Historical Associate Members.

The Institute's Model Room now contains over 400 aircraft models. These range from the beautifully accurate models made from drawings and sketches of pre-Wright machines made by Paul Guillow and his associates, down to the sleek and sharklike X-1, Skystreak and Skyrocket. Notable are the beautifully detailed models of early Farmans and Bleriots, and the extensive collection of World War I machines donated to the Institute from the estate of Peter Brooks. Many of these models have been incorporated in the "First Century of Flight" exhibit described in this issue. As time permits, they will be worked into a completely chronological display of aeronautical history which is planned for permanent exhibit at the Institute.

The above is but a brief description of some of the material that is already on hand. Through the interest of the Historical Associates of the Institute it is hoped that these basic collections will be expanded to embrace every significant type of aircraft in the history of the development of the aeronautical sciences.

43 70

The Collector's Box

In this space we are planning to run an information service for collectors of aeronautica. If you are seeking some particular item and will let us know about it, we will try to find some clues for you, either through our available research material or through correspondence with other members. Should you want source reference concerning any item in your own collection, we shall be glad to assist as far as we are able. Send in your questions, your problems, or your suggestions to us, and we will do our best to be of service to you.

This space will also be available to members who wish to exchange duplicate items with other members. If you will send in a brief description of such items we will try to put you in touch with someone who may have something to "swap."

Address all inquiries to Aeronautica, 2 East 64th St., New York 21, N.Y.

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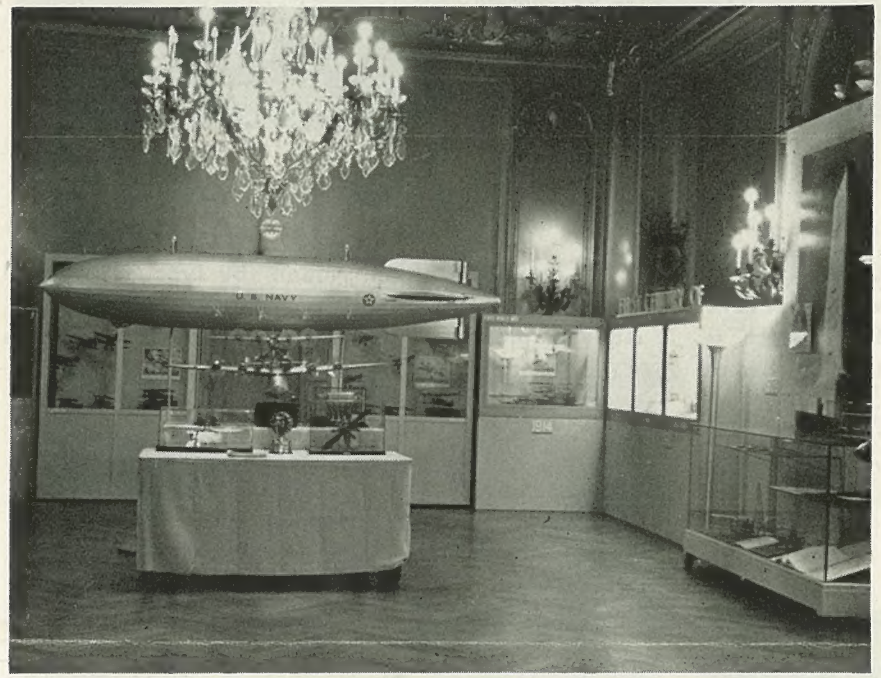


I.A.S. Museum Reopens

Delegates of the R.Ae.S. Preview Newly Decorated Museum at Reception May 23.

Reorganization of the I.A.S. Museum was completed by mid-May. The British Delegates of the Royal Aeronautical Society were treated to a preview of the second floor at a Reception and Buffet Supper given by the members of the Council of the Institute on Monday, May 23.

Both the Print Room and the Model Room elicited many favorable comments from our guests and the Council members. The pale gray wall panels and gray-framed cases, enlivened by touches of coral and deep blue, were noted with pleasure. In the Model Room the new chronological pattern of exhibition also drew approval for its more rational approach to the history of the evolution of mechanical flight.

Our aim is, presently, to arrange educational tours of the Museum's collections for various high schools and other young people's groups. In this connection we are working jointly with the Industrial Museum of Jersey City, which is featuring "Aviation" in its annual summer museum display. We also have contributed some models and posters to a show on Transportation in the Children's Room of the Public Library in New York.

We urge our Historical Associate Members who live near the I.A.S. headquarters to come and visit the Museum since we are anxious to have their comments and criticisms on this particular phase of our activities.

The Museum, situated at 2 East 64th St., will be opened from 9:00 a.m. to 5:00 p.m. every day except Saturday, Sundays, and holidays through the summer.

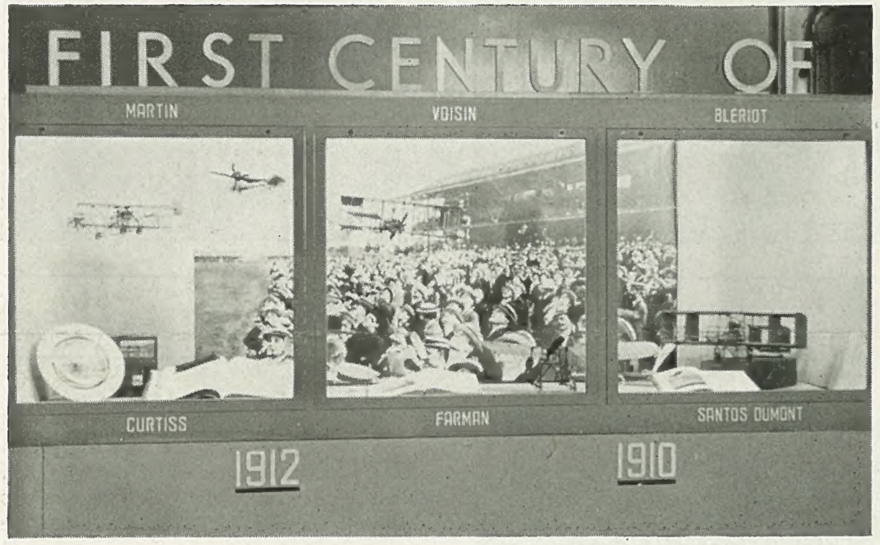
Re "Aeronautica"

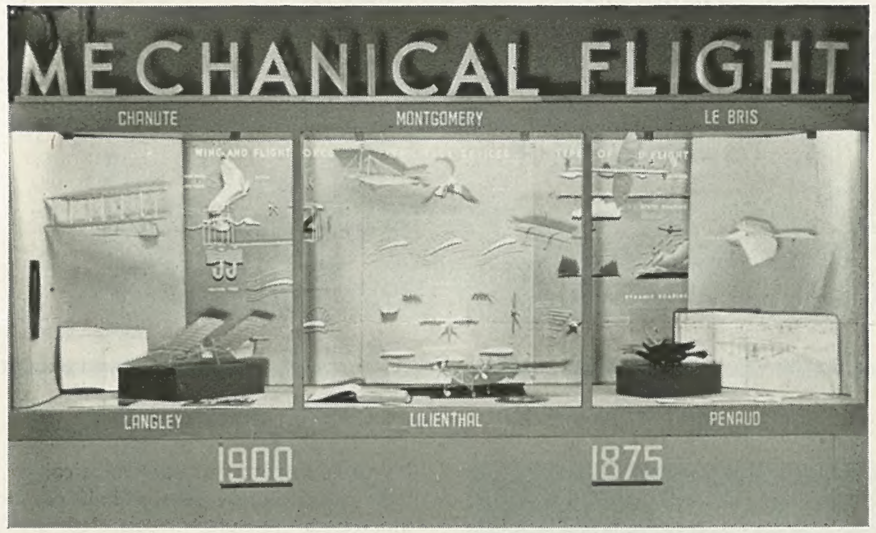
This is the third issue of the Institute's quarterly publication for Historical Associate Members. It contains news of the latest Archives activities and another article on early aeronautical events. A series of such articles by the same, and other, authors is to be published at intervals in the bulletin.

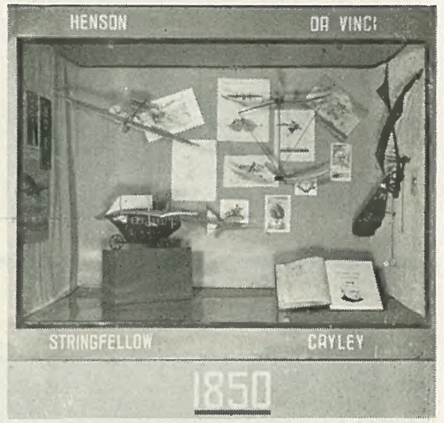
Signed, original articles of similar nature are urgently solicited. Unfortunately, however, the state of the budget does not permit any remuneration for such work.

Your comments and criticisms of Aeronautica are invited. They should be mailed directly to Miss Claudine Lutz, Curator, 2 East 64th St., New York 21, N.Y.

The Archives Presents—







Since its founding in 1932, The Institute has accumulated a large collection of aircraft models. These models have been arranged in a chronological pattern, which is intended to give the visitor an approximate visual idea of the first 100 years of aircraft development.

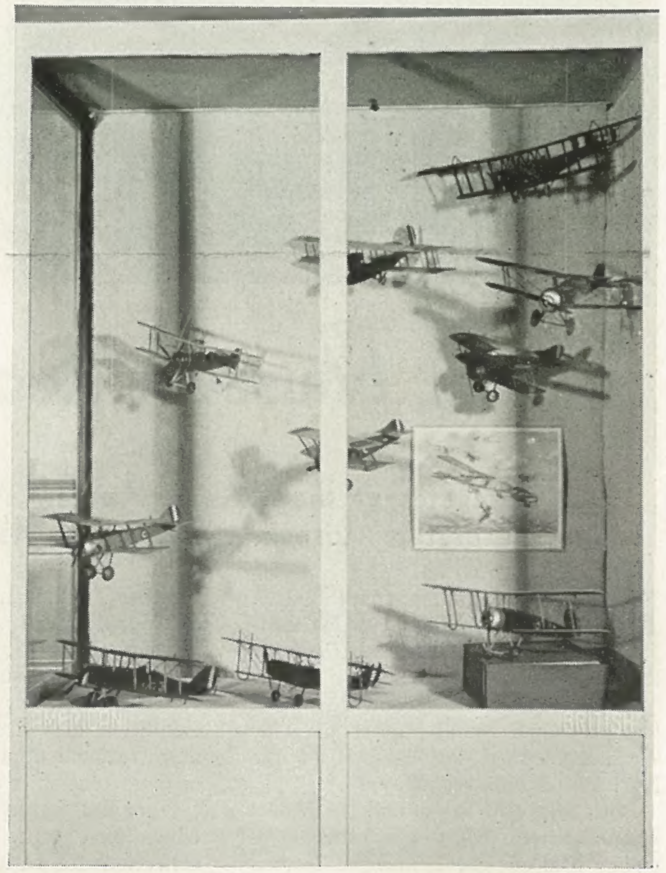
No attempt has been made to relate any particular model to a definite date, but all models are placed in the proper period of time in which they belong.

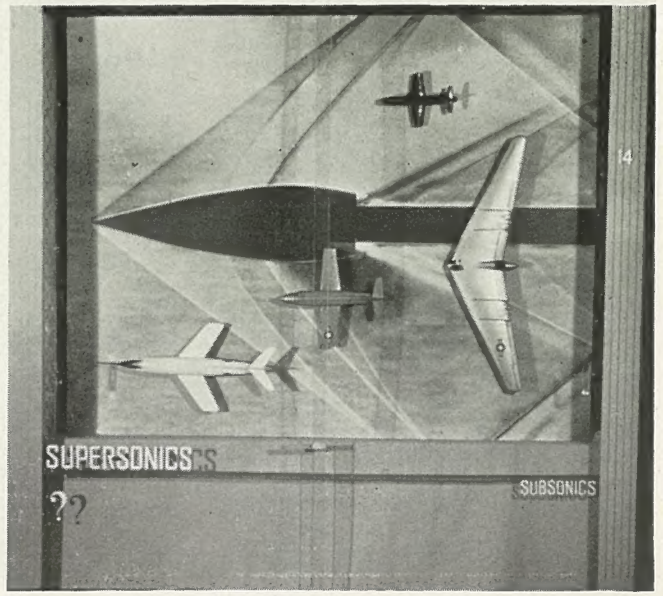
The cataloging of the models (by type, make, etc.) has been started but is not yet complete. Also in preparation are bibliographies covering the various time periods so that resources from the Library can supplement the exhibits.

In time, also, we hope to fill gaps in the present series with additional models of significant aircraft.

There are certain transition types that are missing. It is obvious, too, that the quality of the model work varies and that there is no scale relationship from model to model. Whether or not it will ever be possible to work out the scale problem is a question, but it may be done in time.

This and other historical exhibits of the Institute are presented under the auspices of the I.A.S. Archives Committee, with the support of the I.A.S. Historical Associate Members.

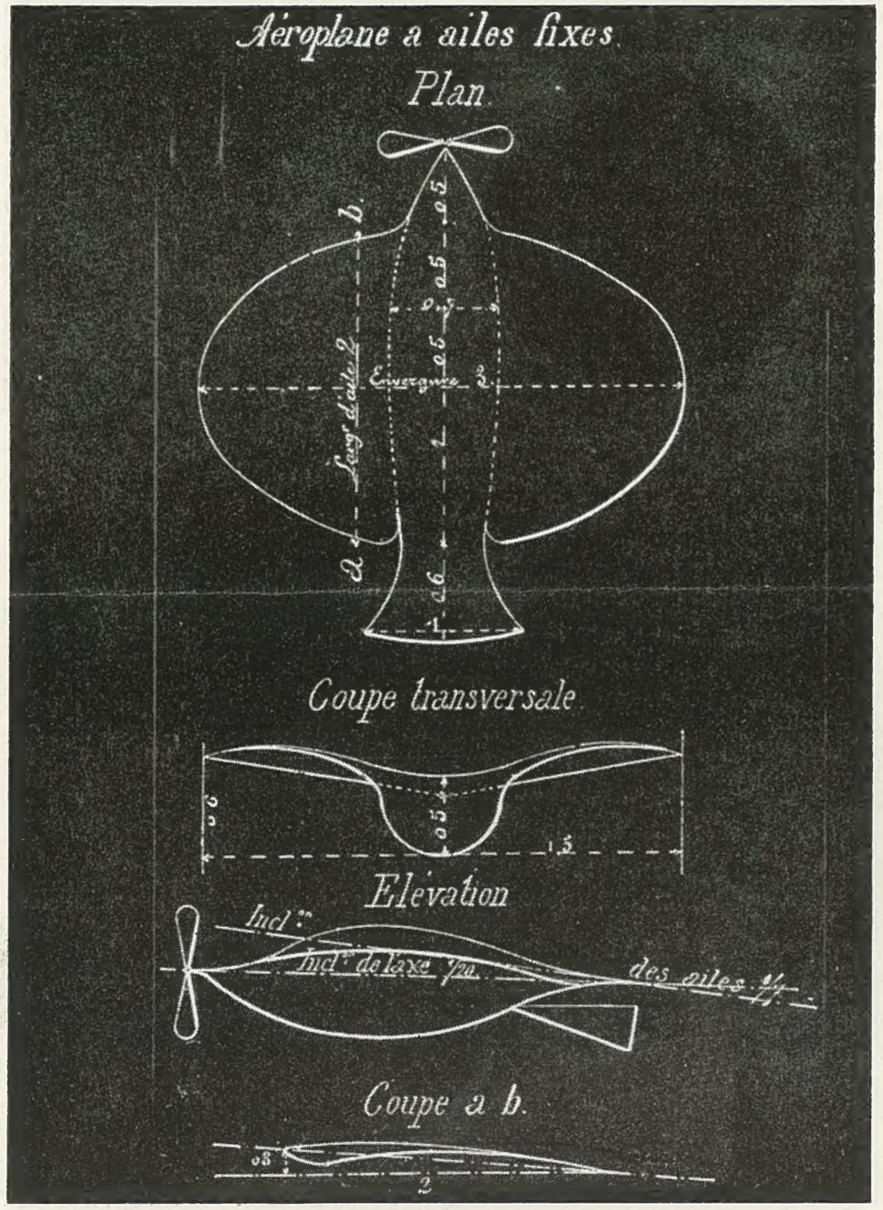




"Dalton's Duck"

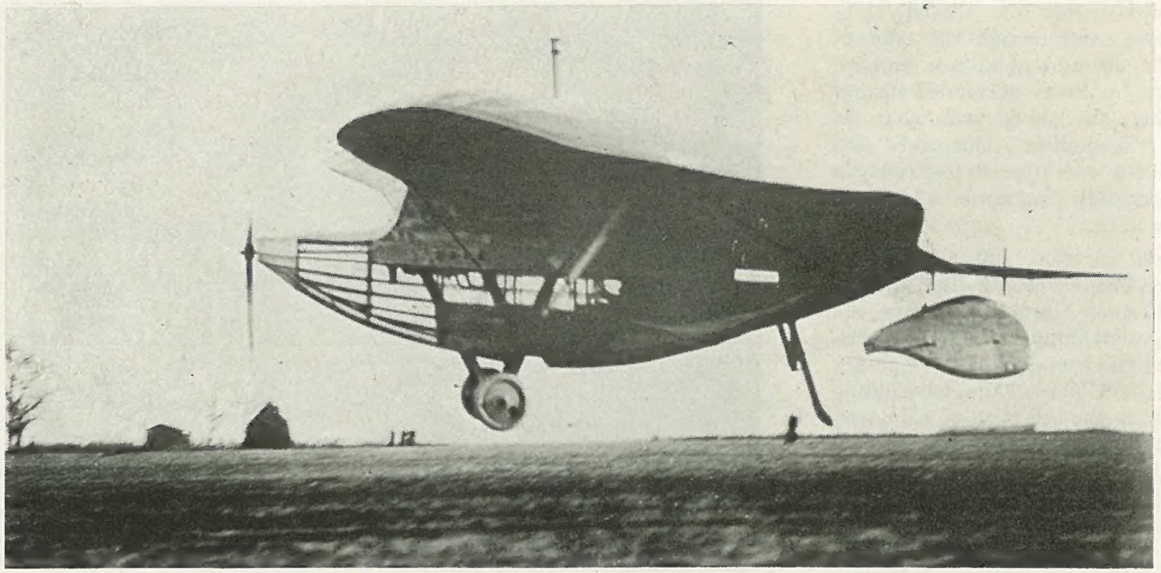
How Alexandre Goupil's Airplane Control Theories of 1884 Were Proved in 1917 Not Too Wide of the Mark. (Reprinted, by permission, from the Technology Review, Edited at the Massachusetts Institute of Technology.)

by S. Paul Johnston



The record of aeronautical research in the second half of the nineteenth century is littered with sketches and descriptions of "flying machines" of an astounding catholicity of pattern. The researches of Cayley and Henson and Stringfellow prior to 1850 had kindled a spark of hope that the age-long problem of flight for man was not completely insoluble. In the upswing of scientific interest that marked the early Victorian era, no scheme for aerial navigation was too fantastic to be put down on paper or to call for heated debate before the scientific societies of the day.

For the most part, these ideas remained on paper and served only to supply material for writers of the Jules Verne school. There were a few exceptions. Horatio Phillips tested some of his airfoil theories with a tethered device that looked like a threshing machine on a circular board track. It never flew. Sir Hiram Maxim produced a steam-driven monstrosity that presently collapsed into a colossal heap of junk without yielding any information of permanent worth. Of the score who sought to solve the riddle of flight, not a single man in those days had the satisfaction of seeing the product of imagining translated into stick and fabric and launched into the air in anything resembling controlled flight. (The French still claim that Clément Ader achieved that goal in 1886. All evidence of history fails to support the allegation, and the foregoing statement is offered up without apology.)



One man, however, had he lived but a few years longer, might have proved an exception. His name was Alexandre Goupil. Could he have stood on a flying field at Newport News, Va., on a January morning in 1917, he would have felt his dream of 35 years before had been vindicated. He would have seen what appeared to be an exact construction from his patent drawings of 1884 wobble down the field and take to the air.

It happened this way.

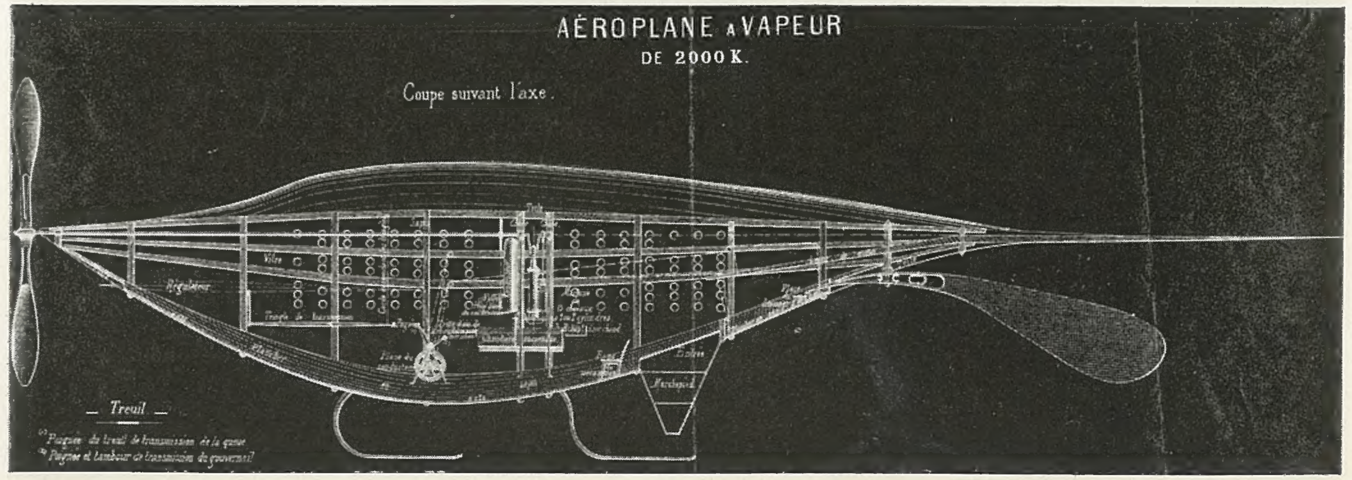
In 1914 Glenn Curtiss found himself on the losing end of a long court battle with the Wrights over the method of lateral control for airplanes. Even though his machines carried interplane ailerons operated by a yoke around the pilot's shoulders, instead of the hand-operated wing warping of Wilbur and Orville Wright, the courts decided that he was an infringer and ordered that he pay royalties on every Curtiss machine sold. This was a bitter pill. The Curtiss temperament rebelled violently. G. H. was a fighter with a dogged determination not to be licked. Besides, it would cost him a pretty penny, for the outbreak of the European war in 1914 had brought undreamed of possibilities for the sale of airplanes from Curtiss factories.

Curtiss' only recourse was through the higher courts. He was prepared to go to the Supreme Court, if necessary. He assembled a corps of experts, both legal and technical, and in 1915–1916 went to work to build up the evidence on which to base an appeal. His staff combed the history of the entire prior art, hoping to turn up something to prove that the Wright's claims had been anticipated.

In those days, the history of aviation was none too well documented. There were few bibliographies—no Institute of Aeronautical Sciences to collect and to classify aeronautical information. It was every man for himself. Even the U.S. patent files were none too good and those of foreign governments, worse. Flying machines (before 1900) had not been considered in the realm of serious invention. The early patentees had their pet ideas filed away in the "crackpot" departments. Searchers would be lucky to stumble across the things they were seeking.

Curtiss' sleuths had little luck. Clues were scarce. They discovered little tangible evidence in patent files or in libraries. None knew where to start.

One day a mysterious visitor turned up with a story that seemed too good to believe. It was the old yarn of the yellowing document found in a forgotten trunk in a dusty attic. It was alleged to be the only extant copy of a patent for a flying machine with a three-torque control system. It would furnish exactly the kind of proof that Curtiss wanted. Only a glimpse of a crumbling sheaf of papers was allowed. It was suggested that it might be a bargain at $10,000. But Curtiss was



too shrewd to buy any allegedly pig-filled poke, even though the odor of bacon was strong and he was hungry. He stalled for time—demanded further proof that the thing was what he wanted. Somewhat reluctantly the ancient book was opened to display a partly concealed diagram of a bird-like flying machine.

That did the trick—but not what the bargainer had expected! He did not realize that on Curtiss' staff was one of the outstanding aeronautical historians of the time—Albert F. Zahm—later to be Chief of the Division of Aviation of the Library of Congress. That quick glimpse started a chain of thought in Dr. Zahm's mind. Carefully piecing together his recollections of his research in the early literature of flight he soon identified the book, *La Locomotion Aerienne*—the author, A. Goupil.

Once the inventor's name was known the rest was easy. A quick search of the U.S. Patent Office files brought the Goupil disclosures of 1884 to light. Curtiss saw in them the answer he was seeking. He had saved his $10,000, but it is only fair to add that, *after* the specifications and drawings had been located and secured from Washington, Curtiss paid the owner $1,500 for the copy of the book found in the attic.

Here was something! But after all, it was only an idea on paper, not exactly the sort of thing to be depended upon to hold water in a Court of Law. All right—then build one, prove that it would work, that should be evidence enough of practicability to establish "prior art."

So Glenn Curtiss ordered his newly established Buffalo plant to build a "Chinese copy" of Goupil's machine, based on the drawings and description of "La Locomotion Aerienne." The job was turned over to A. N. Dalton for construction. Inevitably, the machine was henceforth known as "Dalton's Duck."

Jim LaMont, one of the earliest of airplane mechanics, later maintenance superintendent for Northwest Airlines and manufacturer of gliders for the Army during the War, has vivid recollections of the difficulties that were met and overcome in trucking the awkward "bird" from Buffalo to Hammondsport. (Some of the roads were too narrow—some bridges too low.) He recalls that "The morning after the test we fellows got a football and painted it white and put it underneath the belly, then said—'Dalton's Duck laid an egg!' "

Whether or not the Hammondsport pranksters had in mind the theatrical usage of the expression is not known. In any case, the first trials were not particularly successful. The machine barely got off the ground. The field was too small. After repairs and modification (probably at Buffalo), the Duck was packed off to the Curtiss flying field at Newport News, Va., where there was considerably more room to maneuver.

There, on January 15, 1917, the final trials were held. Victor Carlstrom, one of the best of the Curtiss pilots of the time, was at the controls. John Tarbox, then patent consultant for Glenn Curtiss (now with Edward G. Budd of Philadelphia) and William Volk, patent attorney for Curtiss-Wright, witnessed the trials. Presumably, Dalton (who is also with the Budd Company today) was a more-than-casually-interested spectator.

Compared with the performance of even the worst of the production airplanes of 1917, the Duck was a miserable failure, but fly it did, beyond all question, and, in the skillful hands of Pilot Carlstrom, it not only flew straight away but made a controlled circular flight. It could not in any sense be called a successful flying machine. It was never "flown" more than a few feet off the ground. It lacked the essential practicability of the first Wright machine, but it did embody the three fundamentally necessary flight controls—a vertical rudder for steering, a horizontal rudder or elevator, and, what is most important, a set of rudimentary ailerons for lateral control. Goupil's conception of 1884 was sound in principle.

That was all Curtiss wanted. He had proved a point to his own satisfaction and, he anticipated, to the satisfaction of any Court. The Duck was wheeled back into a hangar to gather the dust of years before it was finally destroyed.

But after all the trouble and the expense (and, we suspect, a certain amount of fun) the Duck served no useful purpose. With the entry of the United States into the war in April, 1917, and in the tremendous expansion of aviation that followed, differences of opinion over patent rights covering aircraft had to be adjusted without recourse to the ponderous machinery of the law. The record of our aviation effort of 1917–1918 is bad enough. It would have been far worse had it not been for the formation of the Manufacturers' Aircraft Association with its patent pool and its cross-licensing agreements. Curtiss' appeal against the Wrights never got into court. It was settled by arbitration under M.A.A. auspices. So, the record of the building and the flying of the Duck was never introduced as evidence before a court. It was soon forgotten in the rush of events. Except for a few pages published over a decade ago in a relatively obscure scientific journal,* no record of its existence has been found in print. Dalton's Duck is now only a dim and dusty memorial to an almost forgotten man—Goupil.

Alexandre Goupil deserves better treatment than most aeronautical historians have given him. Magoun and Hodgins (*A History of Aircraft*) give him a brief paragraph. Dolfuss and Bouché, who overlooked little that added luster to the works of their compatriots in their magnificent *L'Histoire de l'Aeronautique* did little better by him. In this author's summary of aviation's history, *Horizons Unlimited* (1941), Goupil was passed over as one who ". . . undertook an ambitious project in 1884—no less than the construction of a full-scale steam-driven airplane of a total weight of 1,100 lbs. He built a steam power plant to drive it and constructed the machine itself, although he never put the two together. The airplane was tested as a restrained glider but appeared to have been insufficiently stable. It had been built in the form of a bird because Goupil believed he could thereby attain a natural stability. His tests proved him wrong." Subsequent research, particularly a reading of his *La Locomotion Aerienne*, has engendered a somewhat apologetic feeling toward him for such casual mention.

Actually, Goupil was considerably ahead of his times. Many of his aerodynamic theories published in 1884 were ahead of the concepts of Langley and the Wrights almost 20 years later. He had been a student of bird flight for many years. As a member of La Societé Française de Navigation Aerienne, he must have been in close contact with Gabrielle de Landelle, with Felix Nadar, and with Alphonse Penaud. He refers to Mouillard's *L'Empire de l'Air*. He read all the available books on bird flight and made a number of comparative studies of wing surface and weight and of the power required for flight. Although he watched with interest the Tissandier brothers' efforts to build an airship, he pinned his faith on heavier-than-air flight. He appears to have been one of the first to apply the word "aeroplane" to describe a fixed-wing flying machine.

Goupil had extraordinary up-to-date notions of the physics of airflow around solid bodies. He diagrammed the transition from laminar to turbulent flow around various solid bodies. He developed excellent streamlined shapes and was fully aware of the importance of the afterbody.

He developed mathematical theory to account for the shape of birds. He concluded that stability lay in the form that most closely resembled an inverted cone, a form that was approached in the deep bellied bird. He believed that an airplane should have the same general relationship between wing location and body as the bird. He also observed that birds' wings had definite thickness and that in cross section they approximated an airfoil shape. He knew that both the under surface and the top surface were aerodynamically important. In this, he was considerably ahead of many airplane builders of the early 1900's who bothered to cover only the bottom surface of the wing.

He developed a usable airscrew theory after studying carefully other propulsive mechanisms such as oars, rotating vanes, and oscillating wings. He pointed out some of the probable effects of slipstream rotation on the lift of wings and also anticipated the desirability of feathering stationary propellers to avoid interference with airflow over wings. He made a number of simple but useful experiments on the stability of various shapes.

When he came to assembling his theories into a flying machine, Goupil's theories, as we have seen, were not too wide of the mark. A general description fits many a modern airplane—a gull-wing monoplane with a streamline fuselage; propeller in the nose; horizontal stabilizer and vertical rudder aft; and, what is more germane to the present discussion, with opposite-acting auxiliary surfaces (ailerons) attached to the wings for lateral control. The four curved skids that made the landing gear for the original design were obviously a misconception. The substitution of wheels and a tail skid on the Duck was one of the major external changes introduced by Dalton.

The one thing that Goupil lacked (in common with all of his contemporaries) was a suitable power plant. He did design a steam engine and boiler for his machine. It is just as well that he did not try to install it. The outfit weighed just half a ton and developed 15 hp.! It took some 120 hp. (from an engine that weighed not much over

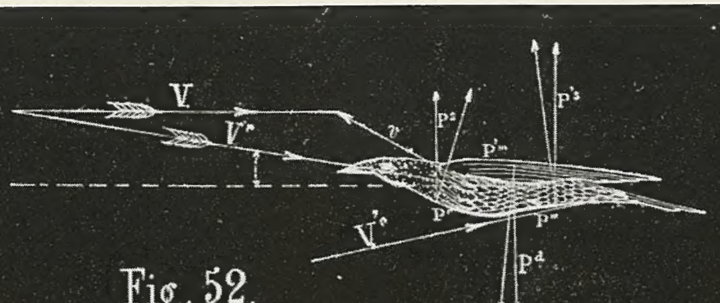


Fig. 52.

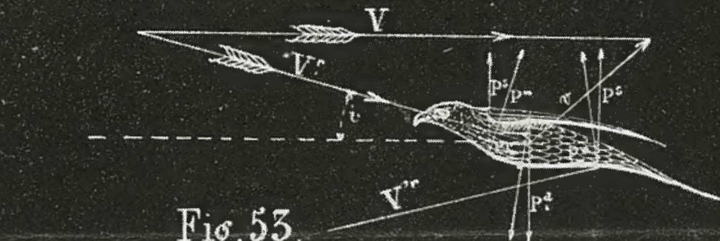


Fig. 53.

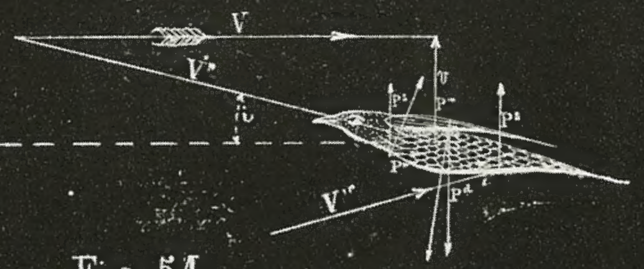


Fig. 54.

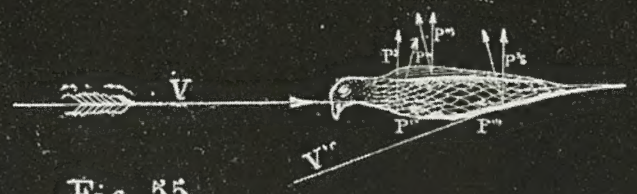


Fig. 55.

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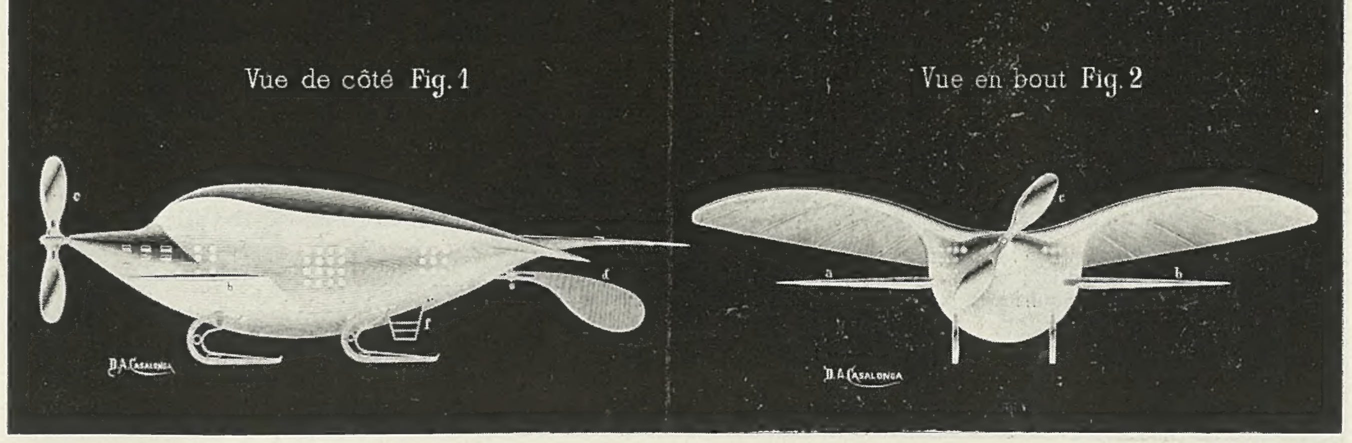
* "Alexandre Goupil, Inventor of Three-Torque Airplane Control." A. F. Zahm, *Journal of the Maryland Academy of Sciences*, Vol. II, No. 2, April, 1931.

AÉROPLANE A VAPEUR



Vue de côté Fig. 1

Vue en bout Fig. 2

200 lbs. complete) to get the Duck off the ground in 1917.

But in spite of the fact that Goupil never flew his airplane, he had some fairly practical notions as to how and where it should be flown. He wrote down a sort of operations manual for it in which he described methods of take-off and landing, with side remarks on weather, selection of terrain, etc. He also described the procedure for maintaining balance in flight by the use of the ailerons—or "regulators," as he called them.

Among the unknowns that would have to be faced by aerial navigators of the future, he anticipated airsickness.

Goupil presents all his findings with a directness that is altogether delightful, always leaving himself an "out"—just in case: "I am presenting my apparatus only as it appears reasonable to me without having any pretention of believing that it will really work properly. These are but primitive mechanisms."

When it came to predicting the future of aviation, however, A. Goupil proved to be a worse prophet than he was a designer. He prefaced his book with the following remarks:

"The solution of this problem of aerial navigation seems to hold little in the way of practical result. It may have some eventual value in carrying small numbers of people through the air for racing purposes (without scientific aim), for scouting for armies in the field, for rapid communication when other means have failed—or simply for sport."

It is a pity that Goupil (who died in 1909) could not have seen the flight of the Duck in 1917. More to be regretted that he could not see our 50-ton air liners and freighters of today or the hundred tonners that are just over the horizon of tomorrow.

The John P. V. Heinmuller Collection

Over a period of years, John P. V. Heinmuller has given over 3,000 air-mail covers from his outstanding collection to the Institute and seven carefully compiled albums of magazine and newspaper clippings, photographs, and letters on Byrd's explorations, Lindbergh's flights, and airship and other trans-oceanic flights. From his experiences as official timer of the National Aeronautic Association at many notable flights, he wrote his well-known book, *Man's Fight to Fly*, a useful reference for aeronautical history, and the original drawings for this book are also among the aeronautica of the Institute.

John P. V. Heinmuller.

Aside from its philatelic interest, the Heinmuller collection of 33 albums of air-mail covers is a unique form of documentation for "first," "souvenir," and "pioneer" flights, especially since many of the covers bear the signatures of fliers, and Presidents, Postmasters General, and other officials. Such pilots are represented as Earle Ovington, Jack Knight, Dick Merrill, Clarence Chamberlin, and Eddie Rickenbacker, and such predecessors as Wilbur and Orville Wright, Glenn H. Curtiss, Louis Bleriot, Claude Graham-White and Thomas Scott Baldwin. Lindbergh takes up an entire album Lighter-than-air, principally Zeppelin, takes up three; Canada, six; the Philippine Islands, three; foreign pioneer flights, one; and international air mail, six. The other 13 albums are American. The collection includes two of six known postcards flown by Baldwin and Graham-White at the Boston-Harvard Aero Meet in 1910; an "Aerial Special Despatch" pioneer postcard carried on October 1, 1911, by Earle Ovington; and a copy of H.R. 3393, introduced in Congress April 21, 1913, and killed by ridicule. This is the original bill authorizing the Postmaster General to contract for carrying mail by aircraft. The Heinmuller copy is autographed by Alberto Santos-Dumont.

Fortunately for the historical record, most notable flights carried mail, and the more active air-mail collectors are interested in accurate historical flight records. The compilations of data on flights by such organizations as the American Air Mail Society and the writings of individual collectors and dealers have greatly enriched the literature of aviation history. Supported by such source material as is found in the Heinmuller collection, this forms a body of data on the history of flight of considerable consequence.

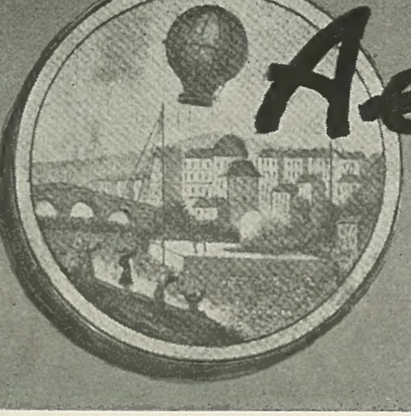
43 70

The Collector's Box

In this space we are planning to run an information service for collectors of aeronautica. If you are seeking some particular item and will let us know about it, we will try to find some clues for you, either through our available research material or through correspondence with other members. Should you want source reference concerning any item in your own collection, we shall be glad to assist as far as we are able. Send in your questions, your problems, or your suggestions to us, and we will do our best to be of service to you.

This space will also be available to members who wish to exchange duplicate items with other members. If you will send in a brief description of such items we will try to put you in touch with someone who may have something to "swap."

Address all inquiries to Aeronautica, 2 East 64th St., New York 21, N.Y.



Aeronautica

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Vol. 2 JANUARY–MARCH, 1950 No. 1

L. A. Historical Associates

Group of 19 New Historical Associate Members Organizes Western Chapter in I.A.S. Building in Los Angeles

JAMES L. STRAIGHT, I.A.S. Assistant Director, who is supervising activities of Historical Associates in the Western Region.

When James L. Straight, I.A.S. Assistant Director, returned to his Los Angeles Headquarters after the New York Annual Meeting in January, he carried with him a certain amount of information and a great deal of enthusiasm concerning the Historical Associates. As a result of his subsequent activities, a new group of Historical Associates has been formed with headquarters in the I.A.S. Building at 7660 Beverly Boulevard, Los Angeles. Many of the new members were formerly a part of the Aero Historical Society, which had been dissolved.

The group has held one meeting and is planning more for the immediate future. The members will avail themselves of the I.A.S. facilities, which include library services, meeting rooms, and space to store files of historical documents, photographs, etc. Western members are most anxious to contact their Eastern colleagues of like interests. For that purpose, we are listing below the names of the members of the newly formed Los Angeles chapter, together with a brief statement of their particular interests. Correspondence with them may be conducted via the columns of Aeronautica—or direct via the Western I.A.S. Office:

Allison, Robert Bruce—Has extensive collection of domestic and foreign material on all phases of aeronautical history, with some published writing.

Ames, William Benton—Has collected and compiled photographs, books, technical data and drawings, building scale models of historic aircraft, military aircraft from 1914 to date. Also interested in National Air Races.

Baumann, J. B.—Interested in whole history of heavier-than-air design. Has collection of data and photographs, and has been active in design of several airplanes other than military.

Bliss, Roland L.—Interested in all phases of military types from 1910 through 1925.

Bodie, Warren M.—Aviation historical collection comprising 4,000 negatives plus several hundred prints. Much publicized writing.

Canary, Jack—Interested in military aircraft and photo collecting.

Clayton, R. G.—Collects engineering prints, three-views, and photographs to make detailed perspective projections rendered in water color, oil, etc.

Enich, Lee—Has been collecting aircraft photographs for 20 years.

Haney, William G.—Interested in history of individual airplanes and pre-1919 flying of both balloons and heavier-than-air craft. Has collected books, magazines, and pictures since 1934.

Kinert, Reed—Author and artist for three books: *Little Helicopter*, *America's Fighting Planes in Action*, and *Our Fighting Planes*. Is a commercial pilot, and is currently at work on book covering a specific phase of aviation history.

(*Continued on page 3*)

Re Aeronautica

With this issue comes an apology for the delay in its appearance. A number of factors—some of them fiscal, some of them beyond our control—contributed. We hope, however, that circumstances will not combine again to unduly retard future issues. The next (Vol. 2, No. 2) is in process and will appear in May, as scheduled.

May we remind you that articles of interest to collectors of aeronautica are always welcomed. Address correspondence regarding such contributions to Aeronautica, 2 East 64th Street, New York 21, N.Y.

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Curator's Report — 1949

The following report covers the operations of the Aeronautical Archives of the Institute of the Aeronautical Sciences for 1949.

(I) Museum Activities

43 70

(A) *Exhibits*

Two exhibits of the Institute's collection were organized during the year. A small graphic development of mechanical flight was scheduled to coincide with the Institute's Eighteenth Annual Meeting in January. The show was formally opened with a cocktail party given by the Archives Committee on the second floor, January 26, 1949. Attendance was great and interest high. The exhibit was kept open through mid-April, 1949.

The second exhibit of the year was scheduled for May, 1949, and coincided with the Second International Aeronautical Meeting of the Institute with the Royal Aeronautical Society. It covers the complete development of mechanical flight for a period of about 100 years. All cases were raised to eye level and were painted a uniform gray, and all models were displayed as much as possible in a diorama fashion. This is now a permanent exhibit.

The main reception room of the second floor was also completely reorganized as a print room. Gray panels were installed with a selection of a few typical prints, and a modern arrangement was made in the main glass case. This room will serve as a display room for temporary exhibits.

The third and fourth rooms of the museum are being used—one as a workshop and the other as a meeting and reading room, as well as a display room for medals and other lighter-than-air prints.

(B) *Gifts and Loans*

During the past year, the Archives was presented with a large collection of air-mail labels and stickers from John Merrick and with a collection of original drawings by John Cuneo, Historical Associate Member.

Various models of current airplanes and other aeronautical items were also donated to the museum for our collections.

The museum inaugurated a series of small loans during 1949. One group of models was loaned to the public library for display in its children's room. Another group of models was loaned to the Jersey City Museum for display in its yearly summer aeronautical show.

(C) *Catalog*

A general catalog of all museum collections is under way. It is hoped that upon its completion we will be able to publish it in pamphlet form for reference use.

(II) Publication

The Aeronautical Archives bulletin, Aeronautica, had its first printing in January, 1949. The second edition appeared in April; the third, in July; and the fourth, in October.

The bulletin has steadily increased in variety of content. It has carried Archives news and articles by members and staff associates on various subjects of historical interest in aviation. Its circulation has been limited to 500 copies, except for the first printing which amounted to 2,000 copies.

(III) Membership

Throughout the year, new Historical Associates were sought. The following shows the standing as of December 31, 1949:

Active Members	55
Historical Associate Members included in other grades in the I.A.S.	14

(IV) General

(A) *Archives Committee*

The Archives Committee met twice during the year, the first meeting being held on December 16, 1948, and the second being held on June 20, 1949.

(B) *Organized Visitors Group*

Throughout the year, visits by groups of students from various high schools and educational clubs in New York City and greater New York have been encouraged. Among these were Casey Jones Academy of Aeronautics, Manhattan High School of Aviation Trades, the Girl Scout Wings Club of Hastings, etc. We have encouraged historians and researchers to use print collection facilities.

(C) *Historical Associate Members' Meeting*

The first meeting of the Historical Associate Members took place on September 21, 1949, in Institute headquarters in New York, and the group heard an impromptu lecture by Charles Dollfus on the subject of aeronautical collecting. Further meetings of this type are planned for the near future.

(D) *Future*

Expanded membership is our greatest need. Help from our existing membership at large is essential. It is felt that the past year has been a test for archives interest and activities. We believe that interest in that field can be developed but will require more time and effort.

Claudine L. Johnston
Curator, I.A.S. Museum

(*Continued from page 1*)

Lawlor, George R.—Collecting data of all kinds of early aircraft, especially prior to 1915.

Oakley, Ralph B.—Considerable published trade paper material; private and glider pilot, especially interested in air-race development during the period 1930–1940.

Rice, George F.—Interested in aeronautical history generally between 1914–1918.

Schmidt, Albert U.—Collects photographs of all types of airplanes, mostly taken by himself, generally having historical significance; many published.

Schmidt, K. W.—Collects designs and flight data on old-type gliders and sailplanes.

Sloan, James J.—Lifetime activity in collection of photographs and technical articles on period 1900–1920. Many published articles.

Stickle, E. B.—Interested in military aircraft, 1910 to present.

Strasser, Emil—Collecting photographs and negatives of all types of aircraft, especially race planes. Has made and collected such photos for over 22 years, with several thousand negatives and prints now in files.

Swisher, William—Main interest is in U.S. Army and Navy aircraft photographs from 1919–1941.

Future issues of Aeronautica will contain more detailed accounts of the activities of our Western Associates, also, we hope, articles and discussions on their favorite subjects.

A Letter to the Historical Associate Members

Dear Member:

A little over a year ago, the Council of the Institute authorized the establishment of Historical Associate Memberships. This grade is intended to service those who are primarily interested in aeronautical history and in the collecting of aeronautica. It was hoped that enough interest could be developed to support the Archives activities and to increase the historical holdings of the Institute without conflicting with its regular technical activities. To initiate this program, the Council authorized the Director to spend up to $4,500 for the first year's operation.

The main expense incurred was the hiring of a full-time Curator and the publishing of a quarterly, AERONAUTICA, of which this is the fifth issue. The year-end report of the Curator, which includes a statement of current membership, appears on page 3. From this report it is clear that the total number of Historical Associates acquired is below expectations. As a result, the overall operation is in the red for the year. This, however, was anticipated, for no one expected that the new activity could be put on a self-supporting basis within its first year. The Council has authorized a continuation of the activity for another 12-month period.

Until we can determine, with your help, the degree of interest in the Archives, we are proceeding on a reduced scale of operations as contrasted with 1949. The Curator is now on a nonpaid, part-time basis. The museum is open from 9:00 a.m. to 5:00 p.m. each day, and an assistant is proceeding with the cataloging and classifying of the Institute's Collections. AERONAUTICA will be continued through 1950 on the same basis as last year (not over 8 pages an issue), since it is our principal point of contact with our Historical Associate Members.

One of the biggest problems has been to develop lists of potential members for this grade. Membership lists, including those of the Early Birds, Wings Club, etc., have been covered, but it has been obvious that most of the interest has come from personal contact with those members of the Institute who were interested in the historical aspect and who passed the word among their friends of like interest.

You can help us greatly by giving us your views on this activity—also, by sending along to any one of your friends who may be interested the enclosed application blank for Historical Associate Membership. We feel that there is enough interest in this sort of thing to put the Archives on a self-supporting basis, but it cannot be done without your help as a member. I should greatly appreciate your advice and assistance in this matter, as suggested below.

Sincerely yours,

S. Paul Johnston

S. PAUL JOHNSTON
Director, I.A.S.

43 70

Your advice on these questions would be helpful:

(1) What sort of historical material should the Institute collect? Rare books? Historical prints? Letters or other such documents? Art objects? Medals; models? etc.

(2) Would you be interested in occasional meetings on subjects of historical interest?

(3) During 1949, four issues of AERONAUTICA were published, one containing 4 pages and the other three containing 8 pages each. Do you think that AERONAUTICA should be expanded or operated on the same level?

(4) Do you have any historical aeronautical material that you would be willing to loan or donate to the Institute's Archives?

(5) Would you be willing or able to contribute any short articles on historical subjects for publication in AERONAUTICA during the coming year?

(6) Do you have any other suggestions?

Aeronautica

Published by the
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Vol. 2 APRIL-JUNE, 1950 No. 2

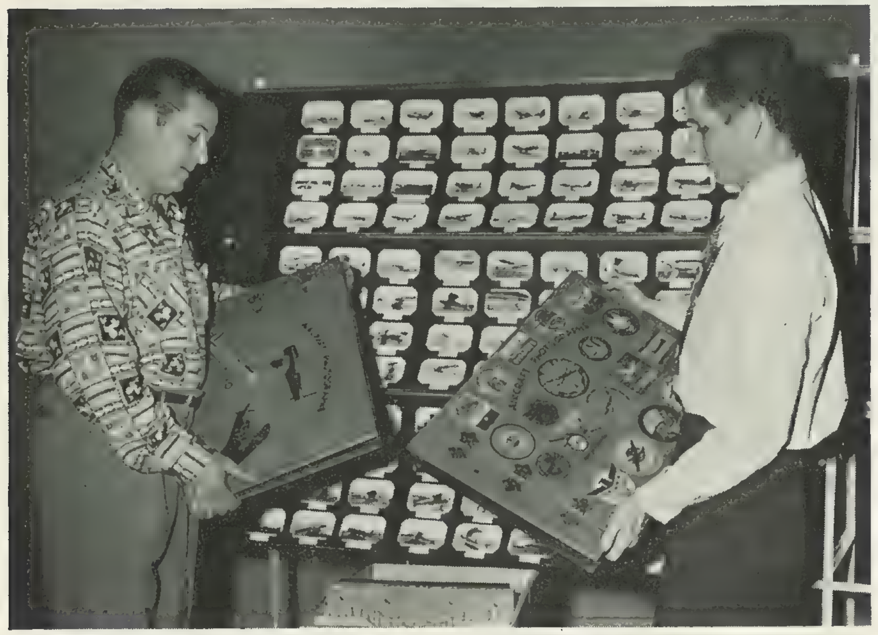


Photo by A. U. Schmidt, H.A.I.A.S

Mr. Lee Enich, H.A.I.A.S., and Mr. Gil Clayton, H.A.I.A.S., of the Historical Branch, Los Angeles Section of the I.A.S., and a portion of Mr. Enich's collection of photographs.

Photo by A. U. Schmidt

James J. Sloan, H.A.I.A.S., elected Executive Chairman, Historical Branch, Los Angeles Section, on March 3, 1950, at first organizational meeting of the Branch.

Committees Appointed for Historical Branch

Historical Associates of the Los Angeles Section of the I.A.S. Organize Historical Branch.

THE HISTORICAL BRANCH, which had its initial meeting on March 3, is an outgrowth of the Aero Historical Society organized last summer by engineering personnel of North American Aviation, Inc. The purpose of both the predecessor organization and the new Historical Branch is to promote interest in and arrange for the preservation of aeronautical material of historical value.

James J. Sloan, N.A.A. Standards Engineer, former president of the Aero Historical Society, was elected Executive Chairman of the Branch at this first meeting. The committee chairmen appointed by Mr. Sloan include: Eugene Clay, N.A.A. Engineering Supervisor, Rules Committee; R. L. Bliss, N.A.A. Handbook Supervisor, Program Committee; Ralph B. Oakley, N.A.A. Aerophysics Laboratory, Publications Committee; Lee Enich, Manuel T. Fine Company, Photo Committee; and George Lawlor, N.A.A. Artist, Archives Committee.

The first activity of the Historical Branch consisted of an exhibit of photographs and models, held at the I.A.S. Western Headquarters Building in Los Angeles on March 25 and 26. Lee Enich loaned his collection of more than 2,000 photographs of airplanes, and Al Schmidt supplied a number of recent enlargements. Models of current military and civil aircraft were supplied by North American, Lockheed, Douglas, Northrop, and

(*Continued on page 7*)

Aide in Aerodromics*

An intimate picture of the early work of Charles Matthews Manly.

by S. Paul Johnston

Charles M. Manly.

IN 1898 THE ODDS AGAINST any engineering graduate being offered a job as an airplane designer or airplane pilot were colossal. No high-powered personnel directors dangled fancy salaries under his nose. No spurred and belted recruiting officer stood by with promises of bars for his shoulder or wings for his chest. In fact, in the spring of 1898 there was only one aeronautical engineering job to be had in the whole United States.

It was offered by Dr. Samuel Langley, then secretary of the ancient and honorable Smithsonian in Washington. He had been working for 10 years trying to prove that it was possible for a man to fly through the air without benefit of hot air or of hydrogen. He had studied the lift and drag of various wing forms on his whirling arm. He had built and flown fragile rubber-powered models. By the end of 1896 he had a number of reasonably successful flights to his credit with steam-driven model "aerodromes" of up to 25 lbs. weight, launched from a catapult mounted on top of a houseboat on the Potomac.

By the spring of 1898, the news of these flights had finally made their way across Washington's Mall and up Pennsylvania Avenue (with a detour around the Treasury) and had induced a faint spark somewhere in the gloomy depths of the War and Navy Building. On May 9, 1898, Langley wrote a guardedly enthusiastic note to his old friend Dr. Thurston of Cornell.

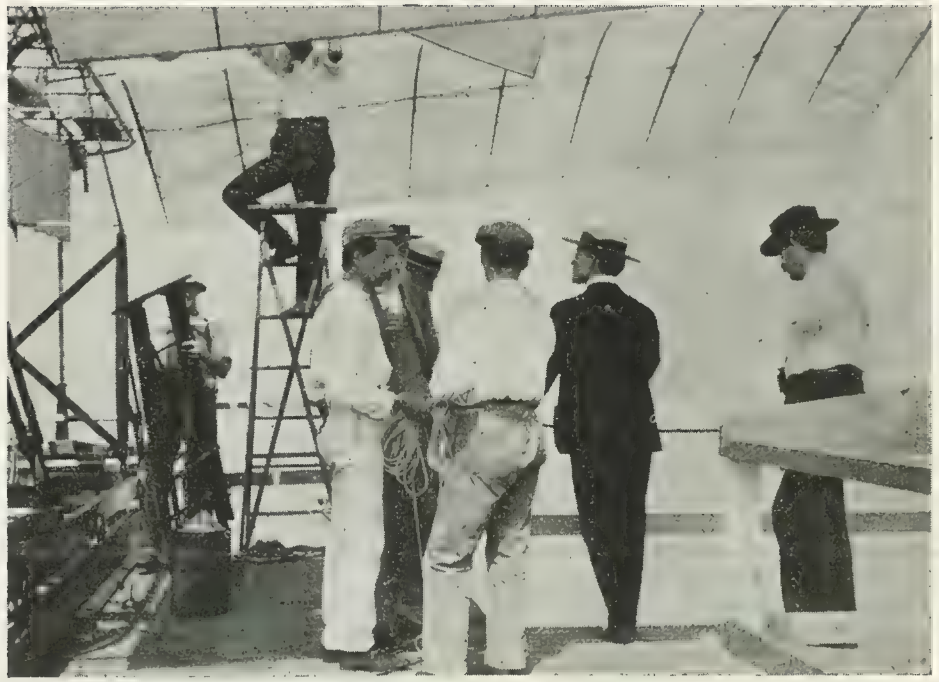
> "I mention in especial confidence that official enquiries from the Army and Navy lead me to think it possible (I hardly can say probable) that an aerodrome capable of a speed of 30 m.p.h. maintained for 3 hours, carrying an 'aeronaut' and possibly some missiles may be attempted. I think it practicable though not to be realized without trial. I should try to have some form of gas engine."

Thus the "come-on"; then, the offer—

> "Have you any young man who is morally trustworthy ('a good fellow') with some gumption and a professional training? If nothing comes of this, I have still some work for such a one in experimenting here, on aerodynamic data, etc."

Certainly there was little in the Langley letter to stampede the Class of 1898. In those days, the path that lay ahead for the engineering graduate was clear and well marked. Beams and boilers and bridges were the things for a young fellow to get his teeth into. There was even some talk of horseless carriages that might sooner or later benefit by a little engineering—but an aerodrome? Well, it was pretty sketchy stuff at best, not much of a prospect for a life work. But this was something beyond the ordinary. More than *gumption* would be needed—*imagination* was the essential ingredient. It called for the best Cornell had to offer. Dr. Thurston ran his eye down the list and drew a line under the name Charles Matthews Manly.

Just what it was that made young Manly forego the pleasures of beams, boilers, and bridges for the doubtful rewards of Aerodromics is not a matter of record. By whatever process he reached his decision, it did not take him long. He did not even wait to graduate properly—his diploma was granted *in absentia.* On June 1, 1898, he reported (sight unseen) to Dr. Langley in Washington, signed the payroll for munificent sum of $1,000 per annum, and presently became Aide in Aerodromics—the only holder of that alliterative title in the whole history of aeronautics. (When he wound up his work with the Smithsonian in the spring of 1905, he was drawing $2,500 a year.)



Mr. Manly with Dr. Langley and War Department representatives on the houseboat just before the trial of the Aerodrome on October 7, 1903.

If Charles Manly had had any prior interest in flying machines, it had been well concealed. Born in 1876, he was raised in the small southern town of Staunton, Va. There he lived the usual outdoor life of the average youngster of the town without exhibiting any particular interest in anything of an engineering or scientific nature. He was well into his salad days when he fell in with the manager of the local electric power station—an engineer, a Cornell man. Out of their talks of kilowatts, of horsepower, and of B.t.u.'s, young Charles began to form some pattern for his life. He read engineering books and papers. He reshaped his college courses. He laid the foundations for a first rate knowledge of mathematics and of science. After he graduated from Furman College (Greenville, S.C.) in 1896, he achieved the first of his self-set goals. He entered Sibley College at Cornell University in the fall of that year.

Although Dr. Thurston's choice 2 years later indicated something of his academic standing, Manly was active in extracurricular activities on the campus. He was interested in athletics but confined his own participation to tennis, which he played passably well. He continued to play when he could find the time throughout his life. As a matter of fact, his death in 1927 followed a heart attack after a vigorous set of tennis.

Neither at college nor in his later life was Manly a recluse. His work occupied most of his time, but when he could he liked to dance and to mingle with people socially. He liked the theater and occasionally took to music for relaxation. Never the life of the party, he was popular in a quiet sort of way with both men and women. He had a keen sense of humor—never slapstick, sometimes salty, and, if occasion seemed to warrant, with a sting in it. His major group interests were in the engineering societies, but in the early 1920's he was often seen at the Kew Gardens (Long Island) Country Club. All his life he was an active member of Sigma Xi Fraternity. He was a Southerner of the Southerners and liked nothing better than to hold up the Southern side of the argument in any "bull session" with the "damn Yankees."

The 2 years after graduation were busy ones for Manly. Ten years later he was able to give a full account of them in the *Memoir on Mechanical Flight* which he authored jointly with Langley. But it was not until March 7, 1900, that he found breathing spell enough to write a brief report of his work to his old friend Dr. Thurston at Cornell.

> "I have been expecting for more than a year now to write to you, and recalling your unusual kindness to me while I was at Sibley, I can assure you that nothing but the very great pressure of work which I have had ever since I have been here could have prevented me from writing earlier.
>
> "I have been exceptionally busy both day and night since I last saw you in Ithaca, just prior to my coming to Washington, the work here having of course been very absorbing and the pressure of it very great. At the same time, however, my relations with Mr. Langley have been of the most pleasant nature from the very beginning, and there has never been a time when he has not manifested the most kind and pleasant disposition toward me, and I desire to express to you my belief that this has been very largely due to the very kind letter of introduction which you gave me when I first came here. Knowing your very deep interest in the work which is now going on here, I regret very much that I am not at liberty to speak of the details of it, as an almost innumerable amount of very interesting problems are constantly presenting themselves.
>
> "As you will readily understand, my responsibility in the work covers not only mechanical engineering problems, but one might almost truthfully say that a small amount of every branch of physical science is included in the general make-up of the problem. . . . I have now quite a large force of workmen, both expert machinists and skilled carpenters, the total number in the Institution shops being more than a dozen besides a large amount of special contract work both in New York and elsewhere, which demands constant supervision. I have also had added some of the best machines of both Brown and Sharpe and Pratt and Whitney. From this it will be seen that there is very little time left for research work in other branches of engineering. . . ."

By this time Langley and his aide were plunged deep in the business of building a full-sized aerodrome. The Board of Ordnance of the War Department had finally put up $50,000, and the Smithsonian had contributed another $20,000. Because Langley believed it a mistake to abandon an idea that had once proved successful, he stuck to the notion of launching the machine from a catapult as he had done with the models. He liked the houseboat, too, because he thought he could anchor it in out-of-the-way places and avoid publicity. He miscalculated on that score.

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* EDITORIAL NOTE: This article is based on material furnished mainly by Charles Manly's younger brother, the Honorable Basil Manly, now a member of the Federal Power Commission; by Mr. Charles Kendrick, his nephew; by Mr. C. B. Veal, his business partner; and by the Smithsonian Institution, his first love. A letterpress book containing copies of Charles Manly's correspondence and reports between August, 1899, and September, 1905, was made available by Hon. Basil Manly. This article is reprinted by permission of *The Technology Review*, edited at the Massachusetts Institute of Technology, Cambridge, Mass.

The disgruntled reporters watched his activities through telescopes and gleefully headlined his failures. Perhaps he might have been spared some of the ridicule that was heaped upon him if he had been a little more cooperative with the Gentlemen of the Press.

Langley provided only the broad outlines of design for the aerodromes, the power plants, and the launching devices. It was Manly who worked out the details, supervised the construction, and superintended the tests. He is remembered mainly for his brilliant work on the engines, but he played an equally important part in the design and construction of the quarter-scale and full-scale aerodromes. Nowadays, when spark plugs and coils and wire and distributors and valves and pistons and rings and gaskets and gadgets are to be had for the asking at any neighborhood service station, it is difficult to recapture the sense of frustration that must have been experienced a thousand times by the experimenter at the turn of the century. He had to invent, design, secure materials for, and build every single item and part before he could test its behavior as a *component* in the main job at hand. A careful reading of the *Memoir* yields hundreds of examples of such engineering and mechanical accomplishments. He did not brag about them. His statements are the direct, impersonal reporting of an engineer: "This was the problem. We tried this—it did not work. We tried that—a failure. We finally hit upon method C (or possibly Z)—it worked."

He did much of the work with his own hands. He had to become skilled in a dozen trades as he went along. He made himself into a first-rate mechanic. Over and over again when others failed on a difficult assignment, he picked it up himself and finished it. During the construction of the large engine, it became necessary to do a tedious and difficult job of brazing to assemble cast iron liners in the cylinder jackets. In describing this work in the *Memoir*, he says: ". . . as no workman could be found either competent to do the work or willing to undergo the personal discomfort, the writer was obliged to do all of this brazing work himself." He does not mention the fact that the many hours put in over the brazing furnace in 1901 and 1902 impaired his eyesight for the rest of his life.

Any hope that Langley or the War Department may have had of securing a practical flying machine for active service in the War with Spain faded, as month after month and year after year went by and the machine was still in an unfinished state in the Smithsonian shops. Like many another experimenter of those years (including the Wrights) Langley was having "engine trouble."

About the time Langley hired Charles Manly, he was negotiating for the development of an engine suitable for a full-scale aerodrome. As a starter, he wanted something of about 12 hp. to weigh around 100 lbs. He finally unearthed a New York inventor and engine builder, Stephen Balzer, who was confident enough in his own abilities to take on such a seemingly impossible job. He had a design for a five-cylinder rotary air-cooled engine that he thought would meet the specifications. Langley gave him a contract.

Balzer soon found that he had bitten off a great deal more than he could swallow. Two years later he was still struggling to make the engine run for more than a few minutes at a time. At best, it showed only a brief 3 or 4 hp. One of Manly's first assignments was to work with Balzer to try to salvage something in the way of a finished engine out of the contract; but it proved an impossible task.

Things looked so hopeless by the summer of 1900 that Langley and Manly went to Europe to see if they could locate an engine that might do the work. By that time, Balzer was almost out of funds (he had used up the entire allotment of his contract in his efforts), and the money remaining for the aerodrome was running low.

But their search was fruitless. Their proposed specification for power and weight netted only ridicule. De Dion, the great French engine designer, told them that he could not build such an engine—*ergo*, it was impossible. Langley continued the search in England and Germany. Manly returned to the States in mid-August to find Balzer completely bogged down. Something had to be done—and quickly.

At that point Manly went out on a limb. He reported Balzer's situation to Langley (still in England) and requested permission to take over the whole engine project himself—an ambitious undertaking for a youngster only 2 years out of school! In desperation, Langley agreed, and the Aide in Aerodromics went to work in earnest. How well he succeeded is a matter of record.

During these difficult days, Manly's relationships with Balzer were always amicable. He wrote frequently. He telegraphed occasionally. He was a frequent visitor at the Balzer residence when he was in New York. There is no doubt but that he picked up a good deal of sound mechanical information from his contacts with Balzer. In the *Memoir* he gives full credit to Balzer's contributions, but the fact is that the final Manly engine was widely different in principle and in detail from the markedly unsuccessful Balzer engine of 1900. If anything, he succeeded in spite of, rather than because of, any ideas that had been contributed previously. Balzer himself never made any claims for any responsibility for the successful engine during Manly's lifetime. It was not until 5 years after Manly's death, and at a time when Stephen Balzer was approaching 80 years of age, that any claims were made on his behalf.

Manly retained only the star-shaped cylinder plan of the Balzer engine (an arrangement not uncommon in certain European designs of the time) and started on the other details from scratch. He ended up 2 years later with a five-cylinder, fixed-radial, water-cooled engine that developed a continuous 52.4 hp. at a weight of about 125 lbs.—a specific of 2.8 lbs. per hp., a respectable figure even today. On several occasions the engine ran continuously at a full power on a dynamometer for 10 hours at a stretch—this at a time when the best automobiles would run only a few miles without a breakdown! It was no fault of the engine that the aerodrome failed to fly. The mechanical difficulties that Manly had to overcome were enough to have given pause to an older and more experienced man.

The full account of the painstaking step-by-step path that led from the noisome shop in the South Shed to the final plunge into the icy Potomac in the late afternoon of December 8, 1903, is too long for retelling here. Langley and Manly did it full justice in the *Memoir*. It was a process that required plenty of "gumption"—and at its climax, plenty of "guts."

Charles Manly had that particular brand of intestinal fortitude. He realized perfectly well the risks he took in volunteering to fly the Langley aerodrome. As early as June 1, 1901, he had written a confidential memorandum to Dr. Langley.

> "Referring to the several conversations which we have had during the past two years or more regarding the question of who will be the aeronaut to accompany the large aerodrome in its coming field trials, I beg leave to say that I am now, as I have been at all times during the past two years, ready to occupy this position.
>
> "Having most closely observed the trials during the summer of 1899 of the model aerodromes Nos. 5 & 6, I fully recognize the danger to which I should be subjected in such experiments in free flight and I desire to assure you that in accepting such a position I do so entirely at my own suggestion and of my own free will and accord, and I beg that you will permit me to express to you my great appreciation of the very kind interest which you have shown in pointing out not only the risk to the interest of the work which such an undertaking on my part would imply, but also the personal danger to which I would be subjected."

On several occasions, Manly suggested to Langley that they should abandon the houseboat catapult, mount the aerodrome on wheels, and test it by making preliminary hops from some level piece of ground. But Langley would consider no alternatives. Although Manly's engineering judgment rebelled at the notion of launching an untried flying machine into full flight from a catapult, he did not hesitate to make the trial when the time came.

After the successful flights of a quarter-scale model early in 1903 there is no doubt but that Manly shared Langley's belief that the big machine could be launched and would fly. The failure of the first trial on October 7, 1903, however, might have been enough to shake any man's convictions. It was certainly enough to have shaken most men's courage. But Manly climbed back into the machine for the second attempt in the late afternoon of December 8 without hesitation. The weather was stormy, it was almost dark, and the Potomac River was full of floating ice. Time was pressing, however, money was running out, and some proof of success was needed to stem a rising tide of public ridicule. Manly made the decision for the test himself. Langley was not even present. As is well known, he almost lost his life on that occasion. He was dragged under the water in the wreckage and succeeded only with great difficulty in freeing himself from the tangle of wires and fabric that surrounded him. When he did break loose he came to the surface only to find himself underneath the ice. Had he not quickly found a break his career might easily have ended at that point. But to read his own account in the *Memoir*, one would think that such events were of everyday occurrence.

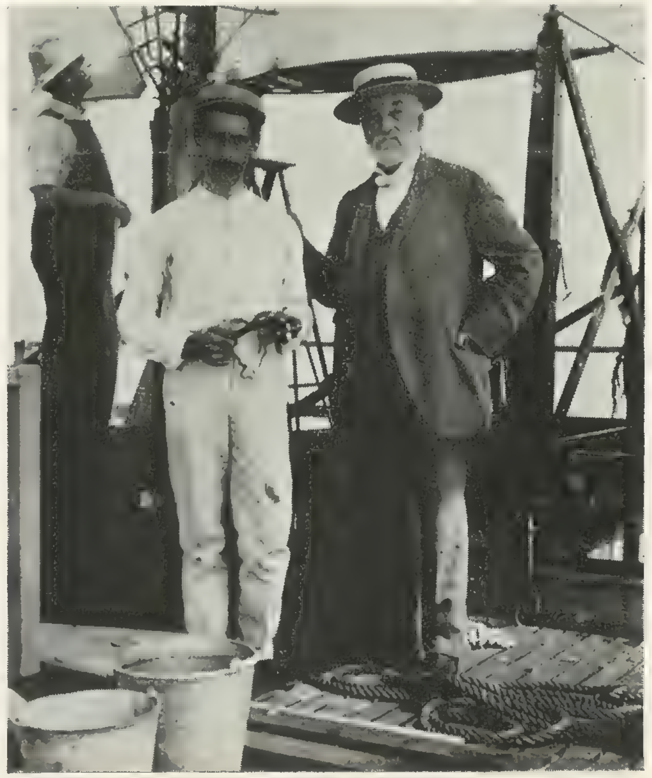
The crash of the aerodrome on December 8, 1903, shortly brought Manly's work with the Smithsonian to a close. Money was exhausted. The blaze of public ridicule that accompanied the final failure was dimmed only by the successful work of the Wright brothers in the years immediately following.

In the early fall of 1905, a curious incident occurred that linked the names of Wright and Manly. That year the Wright brothers were making real progress with their flying from their cow-pasture base at Simms Station near Dayton. They were not avoiding publicity, neither were they seeking it. One day they had a mysterious visitor, a young man who said only that he was a writer of sorts and who did not further identify himself. The Wrights were busy about their machine and paid him scant attention. Later, according to Fred C. Kelly ("They Wouldn't Believe the Wrights Had Flown"—*Harpers*, August; 1940), Orville Wright recognized their visitor in a New York newspaper picture as "Charles M. Manly, Chief Mechanic for Professor Langley of the Smithsonian Institution." The implication was that Manly had been caught "snooping."

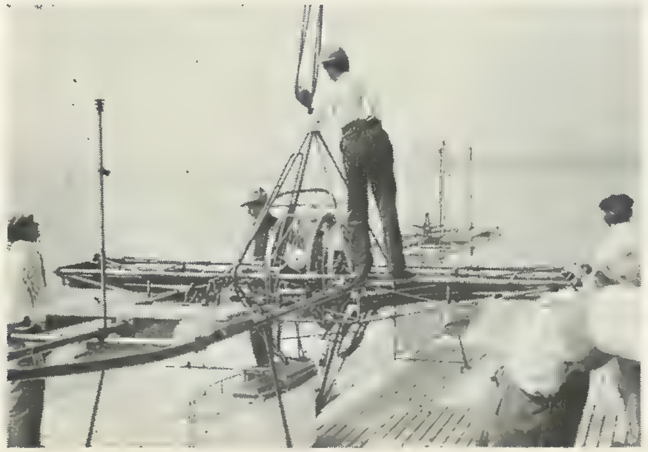
Whoever the visitor, plenty of evidence is available that it was not Charles Manly. In the first place, it would have been entirely out of character for him to visit the Wrights surreptitiously. He had great admiration for their work, and, at that time, the relations between the Wrights and the Secretary of the Smithsonian were entirely friendly. The famous feud that finally led to the shipping of the original Wright machine to the South Kensington Museum in London did not break out until many years later. Aside from that, Manly had left Langley's employ some months before the alleged visit, and no evidence exists of any verbal or written report to Langley of any first-hand observations of the Wrights' flights. Further, none of Manly's associates or employees of the time remember any visit to Dayton. It is extremely doubtful that he could have afforded the trip, since he was then borrowing money to meet the small payroll of the struggling Manly Drive Company.

The Wrights' own records clinch the argument. They recollected clearly that their visitor had no mustache at all or that it was "very close-cut." The fact is that Charles Manly wore a magnificent "handlebar" mustache, of a definitely dark color before, during, and after the fall of 1905. There is ample photographic evidence extant on that score. Someone erred. The Dayton "snooper" was certainly not the ex-Aide in Aerodromics.

In the course of his work with Langley, Manly had hit upon the idea that was afterwards to occupy much of his



***(Right)* Samuel Langley, Secretary of the Smithsonian Institution, and his courageous aide, Charles M. Manly, photographed for the record in the final minutes before Mr. Manly took off in Langley's Aerodrome for the test of October 7, 1903.**



***(Below)* Assembling the large Langley Aerodrome on the houseboat on the Potomac. Charles M. Manly stands on the frame.**

energies—a hydraulic drive, which he later patented and marketed. In 1905 he formed the Manly Drive Company, which was active until 1915. This drive was successfully applied to certain automotive trucks between 1905 and 1916. A few installations were made on naval vessels, notably two battleships for the Argentine Navy. At the time of his death he held some fifty-odd patents on hydraulic machinery, patents that yielded him a considerable return in royalties. He was never a wealthy man, but his work did net him a comfortable living during the latter years of his life.

During World War I, Manly again came into close contact with aviation. In 1915 he became associated with the British War Office as a consultant. He was sent over to the Canadian side to help straighten out a design for a twin-engined bomber that was being built for the Canadian Curtiss interests. Afterwards, he became a consultant for the Curtiss Aeroplane and Motor Corporation and was sent by Glenn Curtiss to England to correct certain difficulties that developed on Curtiss equipment abroad. On his return, he was made Chief Engineering Inspector at the Buffalo plant. His connection with the Curtiss company ended in 1920. He then set up shop as an independent engineering consultant in New York City with C. B. Veal (now of the S.A.E.) as partner, an occupation that kept him busy until his death.

As a natural corollary of his engineering and mechanical instincts, the desirability of standardizing as many mechanical elements as possible had great appeal for him. During his work in the first World War he saw many glaring examples of wastefulness and confusion resulting from lack of standardization. To have a dozen or more *almost* identical "bits and pieces" where one might do simply made no sense to Charles Manly. Because of this interest, he was appointed a member of the U.S. Commission to the International Aircraft Standards Conference held in London during February and March of 1918. After the war, he devoted a considerable part of his time and energy in the aircraft and automotive standards work of the Society of Automotive Engineers (he was president of that organization in 1919). What progress has been made in the direction of standardization of parts stemmed largely from his interest in the problem.

All his life Charles Manly was more of an engineer than a theorist. His scientific and mathematical training was perfectly sound, but he achieved less by brilliant processes of intuition and abstract analysis than by the application of sound common sense and hard concentrated effort. He sat up nights with his problems, but when he got answers they were right. He had the courage of his convictions. He made few snap judgments; he was always sure that he was right before he spoke, and, knowing that, he was always ready to defend his opinions to the last ditch. He made few public speeches—none that he could avoid—but in his committee work he was listened to with respect and was considered a tough opponent around a committee table. He spoke plainly and without equivocation about matters at hand and let the chips fall where they might.

Charles Matthews Manly was a practical man with a sound scientific background supplying plain common sense to the solution of engineering problems. He worked hard and had confidence in his results. He expressed his findings in definite and understandable engineering terms. Such things should be the goal of any engineering graduate, young or old. They can be achieved, even if it is denied most of us to start our careers on such a curious by-path as the Science of Aerodromics.

* * * * * * * * * * * * * *

Air Labels

43 70

Archives Collection Depicts Progress Since Early Commercial Flight.

by Herbert A. Schoenfeld

One of the little known but finer collections in the Archives of the Institute is the Air Label Collection. This fine collection came to the Institute in 1941 through the generous contributions of W. A. M. Burden and Bella C. Landauer. During the past 8 years, additions to the collection have made it about the most complete showing of this fascinating hobby in the world. There are over 30 albums in the Archives, with hundreds of labels that are extremely valuable and that can be found in no other collections.

There are a number of different types of air labels shown in the Institutes' collection. Briefly, there are listed: Air Events Labels, Air Mail Labels, Air Baggage Labels, and Air Cargo Labels, in addition to a large group of miscellaneous labels such as, Air Fund Labels, Aeronautical Propaganda Labels, and aeronautical seals and decorative items.

The largest and most complete showing of air labels in the collection are the Air Baggage Label group. This classification includes Air-Line Baggage Labels, Air Baggage Destination Labels, Zeppelin State Room Labels, and similar varieties. These are particularly rich in depicting early aeronautical history and the progress of aviation since man began to fly commercially. When the public began riding the airways, collecting the Air Baggage Label became popular as a hobby, and, from early collections started in Europe in the 1920's, the hobby spread to the United States where we now find approximately 500 ardent collectors of these items.

The Jack Knight Air Mail Society, a branch of the American Air Mail Society, has been the supporting organization for advancing the hobby of air-label collecting. This organization is now sponsoring a catalog that will list, by country and type, all air labels of the world. This project will be very much like the more popular stamp catalogs, where items are listed by type and price.

It may not be out of order to define an air label as set forth by the *American Air Mail Catalogue* of 1947. "An Air Mail Label is a label which implies Air Transportation and the character of such transportation as for example, mail, passenger or cargo; is a label issued for some aeronautical event; or for aeronautical propaganda or which depicts aeronautical subjects."

The Institute is proud of its fine collection of air labels and takes great pride in showing it to the many interested visitors yearly. With the yearly addition of new air lines throughout the world, the hobby takes on new life and interest from year to year. One can find a complete history of modern aviation in the study of this fine air label collection, and the future holds even more interest in this type of collection at the Institute.

(*Continued from page 1*)

Baumann Aircraft Corporation, and models of older historic planes were supplied by private contributors. Don Dwiggins, Aviation Editor of the *Los Angeles Daily News*, loaned a model of an ornithopter that was granted a patent in 1889.

Periodic meetings of general interest to all I.A.S. members are planned. Motion pictures of historical aviation events are to be shown, and speakers who can contribute information of the past decades of aviation of both local and national interest are being lined up for future meetings.

Television Show

The April 14 meeting of the Historical Branch, Los Angeles Section, was enhanced by a television program from a local station, in which early air-mail films were shown. These included take-offs and landings of the first air-mail planes and later inauguration of night-flying mail routes.

This was the second of the general meetings of the Historical Branch, which was organized in March. Other items in the evening's program were a discussion of the rules and regulations governing the activities of the Branch, in which all Historic Associates are invited to participate and the showing of two films, *Aeronautical Oddities* and *The Fleet That Came to Stay*, followed by refreshments, all of which was arranged by the Program Committee under R. L. Bliss.

Re Aeronautica

We want to thank you for your answers to the questionnaire printed in the last issue of Aeronautica. The response was most gratifying, and your suggestions will greatly assist us in directing our future Archives activities. There are still some of you who have not answered, however, and we would like to hear from you so we can judge more accurately what you, as a Historical Associate member, want from your membership.

We plan to print in our next issue a roster of H.A. members, giving details about each member's particular interests in the overall field of aeronautica. Those of you who would like to add to the information we already have, please send it in.

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History in Medals

Medals Tell the Story of Aviation Achievements.

The Institute's collections of aeronautica are testimonials to aeronautical accomplishments. Early prints, for instance, give a more or less fanciful account of aeronautical endeavor; eighteenth century *objets d'art* mirror the evidence of aerostation in popular taste. We are fortunate indeed to have among our collections a comprehensive representation of a century and a half of aviation pioneering as disclosed in medals. We can pick up the trail at any point in the "march of time" and find that medals were struck to commemorate ascents, new developments, and records of altitude or endurance.

Glancing through our cases we can see a group dated 1783–1785, relating to the birth of lighter-than-air flight, including the experiments of the Montgolfier brothers (Charles and Robert), Lunardi, and Blanchard. From 1802 we have an engraved silhouette on an oblong medal dedicated to Garnerin, the first parachutist.

The nineteenth century medals extol the courageous work of Tissandier and others during the Franco-Prussian War of 1870, and the first achievement of dirigibility in lighter-than-air craft is represented by the 1885 Renard-Krebs Medal. Gliding enthusiasts will be interested in the Otto Lilienthal medals of 1896.

In the years that followed, medals were struck commemorating such endeavors as the Bleriot Channel Crossing, 1910; Glenn Curtiss Award for Transatlantic Flight, 1919; the New York-Paris solo flight of Charles Lindbergh, 1927; the Amelia Earhart flight, 1928; Wiley Post and Harold Gatty Round-the-World Flight, 1931; the Howard Hughes Congressional Medal, 1938; and many others.

We also have numerous medals awarded for military valor. World War I added to the collection. Here, for example, we have the medals to Guyemer, World War I Ace, and to von Richtoffen, the German Ace.

The several Hindenburg medals in the collection commemorate the German effort to develop airships in the period between the wars.

World War II medals include several of German vintage describing the achievements of the Nazi Luftwaffe in the years 1940–1944 against the "cruel retaliation" of the British R.A.F. on German libraries and museums. We also have examples of the four "senior" British Air Medals, a gift from His Majesty's Government to the Institute in 1944. These are the Distinguished Flying Cross, the Air Force Cross, R.A.F. Conspicuous Gallantry Medal, Distinguished Flying Medal, and the Air Force Medal.

Among the postwar medals is one showing a jet engine and one extolling the successful Berlin Air Lift over the barricade of a burly Russian figure.

The richness of our medal cases is due to the generosity of many friends of the Archives including, P. R. Bassett, Mrs. Bella C. Landauer, Dr. O. Kallir, Lester D. Gardner, and many others.

The above is a sample of the type of medals contained in the Institute's collection. This is a gold medal given to Octave Chanute in 1910 by the Aeronautical Society of Great Britain (now the Royal Aeronautical Society). It was presented to the Institute by Mr. Chanute's daughters.

Letter to the Editor

From Henri Hegener, Aviation Writer, Beukenlaan 6, Bennebroek (NH), Holland.

Since comments and criticisms of the contents of your bulletin are requested, may I make a few remarks with regard to the article "Dalton's Duck" published in the July, 1949, issue?

The French didn't claim that Ader made a flight in 1886 (p. 4). He *tried* to fly in 1890 and 1897, but all he did was make a few hops.

The surname of Goupil is Albert and not Alexandre. Gabrielle de Landelle's name is: Gabriel de la Landelle.

Although I do not know the French language very well, in my opinion Goupil's findings (see page 105 of his book *La Locomotion Aérienne*, Charleville, 1884) must be read *literally* as follows: "I am presenting my apparatus only as a summary (aperçu) of what I consider as executable and I do not pretend to believe that it wouldn't be possible to give a better solution."

(Re: William Samuel Henson, April, 1949, issue, p. 7.) Marriott did not patent a flying machine, but he actually built a small airship (dirigible) called "Viator." (See *Flight*, London, 1911, p. 944, and Miller, "The World in the Air," p. 31, Vol. II.)

Could you try to find out who made the first parachute jump from an aeroplane in the United States? According to most sources, it was Berry who jumped on March 1, 1912, over Kinloch Park, St. Louis, Mo., from a Benoist aeroplane piloted by Tony Jannus. However, the famous parachute pioneer, Floyd Smith, found that a stunt man by the name of Grant Morton was the first man to have jumped with a parachute from an aeroplane. It happened over Venice Beach, Calif., late in 1911. Phil Parmelee was the pilot, and the plane was a Wright Model B. There must be some truth in this statement, since a countryman of mine wrote in the Dutch aviation magazine *Avia* of May 15, 1912, p. 16, that, being in Venice, Calif., he watched William Morton making a jump from an aeroplane piloted by Phil Parmelec (Parmelee). A pity he didn't say *when* he saw Morton jump.

The Traders' Corner

We are starting in this issue a "swap column" for those who might have items in their collections which they may want to trade or sell or for those who know where to obtain something that some other member might be interested in. We have no paid advertising, but we feel that our position as middleman in this instance may be of considerable assistance to our members.

43 70

For Sale

In perfect shape—the two books listed below—

Aerial Navigation
1894 Appleton
J. E. W. Fryje Van Salverda

Aerial Navigation
Frederick Walker, C.E.
London, England, 1902

For details write to the Archives or to H. T. Kraft, The General Tire and Rubber Company, Akron, Ohio.

Available

▶ Complete collection of aeronautica: books, pamphlets, pictures, programs, etc. An H.A. member writes that he is interested in selling his whole collection. He describes it as covering all phases of the history of aerial experimentation, navigation, and warfare. Communicate with Edward L. Sterne, 4514 Fulton St., San Francisco 21, Calif.

▶ Attractively framed set of famous color prints of seven epic flights. Each print is autographed by artist. Portfolio was originally issued in 1929 in limited edition by Wright Aeronautical Corporation. Now rare; excellent condition. Price, $250. Contact E. B. Stair, 37-06 82nd St., Jackson Heights, N.Y. Phone: Havemeyer 6-5600.

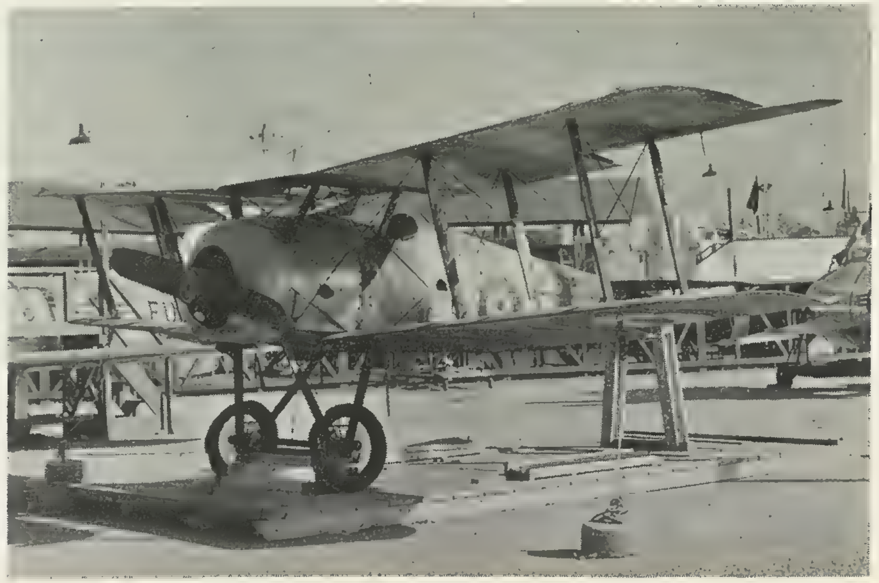
▶ Available to some collector of authentic items of aviation history—the original Hart, Eustice, Controllable Pitch Propeller. This propeller is the first to be successfully flown, as well as officially tested, at the old McCook Field, Dayton, Ohio. Wright Field has the original records of flight tests made in 1917—1918. Authentic records, photographs, and news items are also available. For information, contact Aeronautica.

Field Trip to Photograph the "Snipe"

On March 11, a dozen members of the Historical Branch went to the National Orange Show in San Bernardino, Calif., where several airplanes of historic interest were on display. The group took many pictures of each of the planes, but the main interest centered on a 1918 wartime Sopwith Snipe that had been brought to this country from England in 1926 for motion-picture work. After being used in several pictures, it was donated to the Los Angeles County Museum by Reginald Denny. The Snipe had been famous as a fighter used near the end of World War I by the R.A.F.

A striking contrast between the old and the new was made by the Snipe and the McDonnell XF-85, jet parasite fighter, loaned by the Air Force. Other planes included a DH-4, Vought VE-7, Curtiss Robin, and Douglas M-2.

Photo by A. U. Schmidt



Aeronautica

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Among those present on June 27 were: Dr. John Carruthers, a collector of aviation historical material; Roy Knabenshue, early pioneer balloon builder and aeronaut; Garey Carr, author of *100 Years of Aviation in California;* Miss Pearl I. Young, Associate Professor of Physics at The Pennsylvania State College, Center of Pottsville, Speaker of the evening.

L. A. Historical Branch Addressed by Professor Young

Two special lectures given by Prof. Pearl I. Young, of The Pennsylvania State College (Historian and Physicist), at I.A.S. Los Angeles Headquarters.

"OCTAVE CHANUTE—PIONEER TRANSPORTATION ENGINEER" was the title of the lecture given by Miss Young on June 27 at a special meeting of the Los Angeles Section of the I.A.S. Miss Young was on a trip to the West Coast primarily to interview the two daughters of Octave Chanute in connection with the book she is writing about this famous aviation pioneer.

The history of the personal side of Chanute was the subject of her lecture, with particular emphasis on the 1896 glides. (Excerpts of Miss Young's talk are given on pages 2–5 of this issue of Aeronautica.) The meeting was at-

(Continued on page 8)

Re Aeronautica

We are sending out Reply Postcards in the near future to obtain accurate information about your interests and activities in the field of aeronautical history. This will be distributed in the form of a Roster to all Historical Associate Members in order that you may know something more of your fellow colleagues in this field. Any suggestions you want to make as to the type of information you would like to have will be appreciated.

Several members who are keeping a complete file of AERONAUTICA have wanted to obtain copies of Vol. 1, No. 2, which is out of print. If any members have any extras they do not want, please send them back to us.

Please address correspondence to AERONAUTICA, 2 East 64th Street, New York 21, N.Y.

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Pioneers in Aeronautics

Behind the Scenes with Octave Chanute and His Assistants in the Summer of 1896

by

Pearl I. Young

Excerpts from a speech given before the I.A.S. Historical Branch at Los Angeles, June 27, 1950. The same material will be published as a part of a book-length biography of Octave Chanute by the same author. The presentation here is in the form of a two-act drama, based largely on Chanute's diary of the period.

Octave Chanute.

Time: Summer of 1896.

Place: Dunes of Lake Michigan, 30 miles east of Chicago.

The Actors: Octave Chanute—born in Paris, Civil Engineer, 64 years old.
A. M. Herring—born in Georgia, Mechanical Engineer, 29 years old.
William Avery—carpenter and electrician from Chicago, 26 years old.
William Paul Butusov—born in St. Petersburg, Russia, 45 years old, barber and student of bird flight.
H. T. Ricketts—medical interne to set broken bones and cook.
Charles Chanute, Joe Card, newspaper reporters, villagers, and fishermen.

To set the stage a bit, here are the circumstances that brought this oddly assorted group of men together at this isolated place. It was a common interest in the science of human flight.

Octave Chanute was born in Paris in 1832; he came over to the United States in 1838 in a sailing ship when his father was asked to be Vice-President of Jefferson College in Louisiana. In 1844, the Chanute family came to New York via the Mississippi River, the Ohio, and the Portage railroad. Until 1849, Octave went to the Coudert School in New York and then went out as chainman on the Hudson River Railroad. In 1857, he married Annie James, of Peoria, and built railroads, the Chicago stockyards, bridges, etc., in Illinois until 1867. In 1867, he moved to Kansas City to build the famous Hannibal bridge over the Missouri and also some railroads in Kansas, including the one through the town of Chanute, Kan., named for him. From 1873–1883 he was in New York City, Chief Engineer of the Erie, laying out elevated railways for N.Y.C., studying timber preservation, and other things. In 1883, he retired from active railroad work, built bridges for the Sante Fe, operated a thriving Chicago Tie Preserving plant with Joseph Card, and was active in the Columbian exposition, St. Louis 1904 Fair, etc.

The puzzle of the exact day and year in which he began dreaming of airplanes as successors or adjuncts to railroad trains, I have not yet been able to verify. It was between 1857 and 1874. In *McClure's Magazine*, 1900, he says, "considerably over 40 years ago I became interested in the problem of flight." His daughters place it at a railroad meeting in Peoria, from whence he moved about 1864. He collected all sorts of books and newspaper articles on bird flight, gliders, light engines, etc. Upon retirement he spent more and more time on what he called "the hobby of my old age." From 1895 to 1900 he really spent a great deal of time and money on it.

By 1896, then, he had published several things on aeronautics and was well known in the United States and the rest of the world as an intelligent follower of the new science. He even put an advertisement in the *Scientific American* for people with ideas of flight to communicate with him, and he collected from this a choice bunch of inquiries, both oral and written, from an odd assortment of men.

Among his correspondents was young A. M. Herring. As a student in mechanical engineering at Stephens Institute in Hoboken, Herring had submitted as a senior thesis "Flying Machine as a Mechanical Engineering Problem." When his thesis was refused as being too imaginative, he got mad and quit school just before he was to graduate. He made a Lilienthal glider and began experimenting with it. From June until November, 1895, he worked for Langley at the Smithsonian. All this time he was writing to Chanute. Suddenly he up and wired Chanute he had quit his job and was coming out to Chicago to work for Chanute.

Chanute had already begun building a full-sized glider and had gone across the street to Avery's carpenter shop to have one constructed. The elder Avery did not want to tackle it, but he said his son, Bill, would be just the man. So, young William Avery was building both a Lilienthal and a multiwing glider, probably in the Chanute attic on Huron Street.

Butusov was listed in the Chicago directory as William Paul. He had decided to drop the last part of his Russian name. When you read of William Paul or Butusov in the articles of early gliding, they are one and the same man. He was a Russian sailor who, while sailing the Cape of Good Hope, had become enamored with the albatross and was sure he could make an apparatus that would carry a man and glide through the air like a big bird. He claimed to have built one and glided down by Mammoth Cave, Ky. He had appealed to Chanute for aid, and Chanute had agreed to finance his family, pay for the apparatus, and take it down to the dunes and test it ($500–$800).

When Herring suddenly turned up in Chicago in need of a job, Chanute took him on the payroll, together with Butusov and Avery, and even let him and his family live in the Chanute house while the Chanutes were in Florida for January and February, 1896.

This is the picture, then, as the play opens. Avery and Herring were building the models in the Avery shop and the Chanute attic; Butusov was building his at home (253 W. 46th St., Chicago). Chanute had been writing to Lilienthal (Germany), Pilcher (England), and Hargraves (Australia) and was on their side; human flight would be conquered by first working out the problems of stability and control with a man-carrying glider and then installing a motor and propellers. On the other side were Langley and Maxim, going to put in the motor and take off from a launching platform.

Curtain goes up on: Act 1—June, 1896.

On June 18, Chanute wrote to the station agent at Miller, Ind., saying that he wanted him to engage a horse and wagon to take tent and supplies out to the shore. He and his party would arrive on Train No. 2, Monday, June 22.

Notes from Chanute's Diary

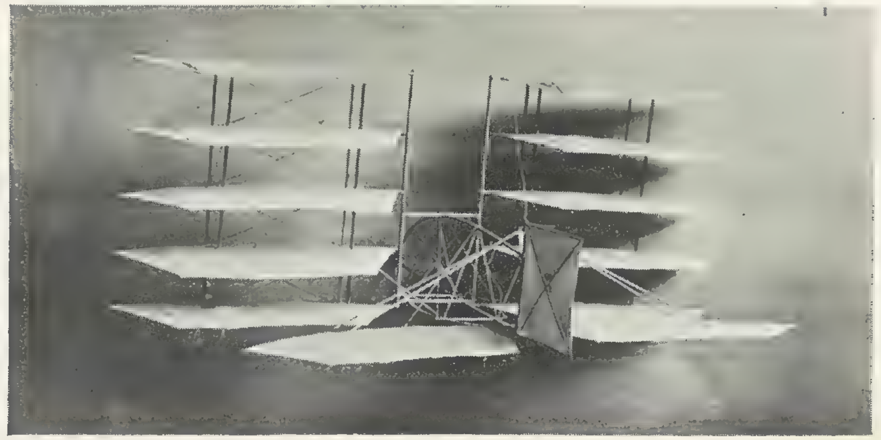
June 22, 1896—Reached Miller, 8 a.m. Took outfit to Sand Hills and pitched the tent. Herring erected the Lilienthal machine. Took several jumps, the longest about 70 ft. The apparatus is cranky and falls about 2 or 3 horizontal to 1 vertical. Wind N and steady. Had a number of visitors, one of whom telegraphed Chicago that experiments were being made.

June 23—Herring erected 12-winged machine. The wind was gusty and the machine swerved about so that he could not locate center of pressure. Laid it aside. Practiced with Lilienthal. Got a number of fair jumps. It is a *gliding* not a *soaring* machine and little is to be expected from it. Wind Easterly. Had a reporter from *Tribune.*

June 24—Practiced with Lilienthal. Herring got good jump. 80 to 100 ft. Paul tried and was upset. Tried the 12-winged. Found it steady but lifting too much in front. Tied on 12-lb. bag of sand in front. Got a short flight but machine blew over after lighting and broke. All are afraid because of its novelty. Wind SE. Experimented with both kites.

June 25—Repaired 12-winged machine and reset it as 8-winged. Located center of pressure just under first pair. It proves more steady than Lilienthal's and promises to soar. Took a few short runs but wind too strong and gusty. Experimented with Herring kite.

June 26—Tried Chanute apparatus with 8 wings, and found it much better balanced than with 12



An early model of a twelve-winged glider.

wings. Surface was 118 sq.ft. Were afraid to jump with it as the wings seemed too frail to sustain a man of say 150 lb. and 25 lb. of machine. Made tests of wind currents with down feathers, and found it was deflected downward after leaving wings. As a result, began the construction of a kite with circular frame.

June 27—Rigged up machine with 4 wings in front and 8 behind. The latter superposed to 0.4 their breadth. Found this much easier to handle than Lilienthal's and more stable than any arrangement yet tried. Jumped 27 ft. in wind of 7 to 10 m.p.h.

June 29—Tested 12-winged machine with 4 wings front and 8 behind. Found it better balanced when standing still in wind than with any previous arrangement, but found that the front was insufficiently sustained when in flight (59 sq.ft.). The rear held up better than with wings as previously staggered.

Next tested with 8 wings front (118 sq.ft.) and 4 behind. Found machine nearly as easy to control when standing still and sustaining much better in flight. Both Herring and Avery made glides of 76 ft. against a North wind and pronounced the machine more stable in its present shape than that of Lilienthal.

This seems the proper shape to adopt; i.e., the supporting surface at the front with the load (operator) directly under the center of those wings and about one-half or less surface in the rear to steady the flight and act as a tail. Got several good flights out of the Lilienthal—one of 116 ft. Found it out of balance and tried to remedy this by cutting away part of one surface. This made it worse. Had a flight of about 110 ft. at end of which it turned over after alighting and was broken beyond repair. Glad to get rid of it.

June 30—Raised wings in Chanute glider to test whether the increased leverage of machine would make machine more difficult to control and whether the increased distance between wings would make the lift greater. Total weight machine 37 lb. and 5 lb. bag of shot in front.

July 1—Wind light all day. Got flights of 30 ft. and found it apparently as easy to handle as with the top wings lower down. Thought it sustained the weight better, but could not be sure as wind was 5 to 10 m.p.h. After waiting till 5 p.m. for more wind, took off the upper back wing and inserted it in the wind space under front top surface, thus having five sets of wings in front (148 sq.ft.) and having one set at bottom in rear (29 sq.ft.). Called this the "Katydid."

July 2—Found machine as steady and manageable. The lift was greater and the head resistance apparently less. Took scores of glides. The best by Herring, 69 ft. at a descent of $17\frac{1}{2}$ ft. or 1 in $3\frac{1}{2}$. Took one photo in flight. Wrapped gunny sack around the wires crossing above the shoulders, so as to rest thereon and found this a great improvement. The rear wings flex up behind in flight and preserve the fore and aft balance. They seem to be in the right place. The machine swings itself into the wind but would be improved by keels. I am well satisfied that this is the type to adopt for rebuilding. Machine can be arranged to slip in intermediate wings when the wind is light.

POINTS TO OBSERVE

Put man directly under the supporting surface.
Make the man comfortable.
Place lower wing 2 ft. 6 in. above the ground.
Provide a running board.
Provide variable extent surfaces.
Set wing 7° above the horizon.
Set top wing ° above horizon. [AUTHOR'S NOTE: Evidently meant to insert value later.]

July 4—Northerly wind, 6 to 13 m.p.h. Made a few jumps in forenoon, best one 55 ft. Wind freshened about noon and made a number of excellent jumps. Best ones, Avery 78 ft., Herring 82 ft. 6 in. Quit at 2 p.m. Packed up and went to Miller. Left on 6:41 train. Sending tent and material home by express. Winged machine is more compact and handy than Lilienthal's and it promises to be safer and steadier.

Act 2—Location: Dune Park, Ind., August 20 to September 24

August 21—Got unloaded at 1:45 p.m. Pitched the tent and got things settled. A fearsome storm came up at 3 a.m. Blew the tent down and rained very hard. The party got very wet and provisions were damaged.

August 24–29—All week getting set up and building trestle for Paul's machine.

August 31—Herring cut down 3-winged machine to two surfaces of 135 sq.ft. Took a number of leaps, the longest 97 ft. and found machine stable and well able to support weight in a 15-m.p.h. Northerly wind.

September 4—Wind in North 15 m.p.h., all conditions favorable. Got out Herring machine in forenoon, took 10 to 12 beautiful glides; longest.

Avery $10\frac{1}{2}$° 253 ft.
Herring 11° 239 ft. (see Epilogue)

Chanute machine completed. Took it out of the tent but it would not lift. Needs balancing and overhauling. Paul machine virtually completed. Put on cloths and took it to launching ways to try the fit. Bound on edges and shoes did not bear alike. Made alterations. Tested wings with new angles for guys. Spilled the wind. Needs an additional strut.

September 5—Wind NW. Tried Chanute machine but results not satisfactory. Tried Herring machine 3 short glides. Two storms in p.m., 60 m.p.h.

September 9—Wind still in South, 20 to 30 m.p.h. Gusty. Tried to test Chanute machine for wing movement. Suspended it between two trees. Found that by throwing wings forward, ascending pressure was obtained. Herring raised by a gust and post of rear wings was broken.

September 10—Wind still in South. Absurd article in *Chronicle* leading press to report that party had been tossed into the air. No testing could be done, but made some changes in Chanute machine.

September 11—Made flight in both machines; wind N.

Chanute Machine 22.3 m.p.h.			Herring Machine 31 m.p.h.		
Herring	148 ft.	7 sec.	Avery	199 ft.	7.8 sec.
Avery	174	7.6	Herring	234	8.7
Herring	166	7.5	Herring	220	9
Avery	188	7.9	Herring	235	10.3
Herring	172	7.8	Avery	256	10.2
			Herring	359	14.0

Both machines made steady glides. Herring once raised suddenly and turned out of course. Laid this to stop cords and cut them. Machine seemed to work better thereafter.

September 12—Wind NE but veering. Put plane further back on Chanute machine but did not test it. Worked with Herring machine in a.m. but made no great progress. Wind to North about noon. When wind turned North told Paul he might proceed with erection of machine. Completed by 4 p.m. Heavy fog settled on lake and land. Wind 25 m.p.h. and very gusty. Deemed experiments unsafe and took off sails from machine. Herring went off by himself instead of helping with preparations and used his machine. Got a number of very good glides, the longest being 359 ft. at 10°.

September 15—Wind East in a.m., changing to Easterly 28 m.p.h. Got Paul's machine on the hill and into the ways. Tested it for fit and tallowed the ways. Took it out and staked it on the plain while at lunch. Put it on the ways again in p.m. Paul got in it and tested it for balancing. Was lifted $2\frac{1}{2}$ ft. above the ways and determined that the machine was under control. Concluded that the center of gravity was about where he wanted it and the lifting power ample. Got main rope and guy wires out to launch it off in ballast from the ways and test it as a kite about 5:30 p.m. Having discovered a small rip in one wing and a buckling of a brace, thought it more provident to take machine from the ways and anchor it for night on the plain.

September 16—Wind changed in night and blew from SW. Moved the machine and got it ready to fly as a kite on the plain when a threatening squall at 2 p.m. determined taking it down the hill to the tent. In afternoon tried Chanute machine with plane further back of wings and found this an improvement. Tried the plane with the convex side down and found this diminished the lifting power, but increased the steadiness. Wings were too much raked to exhibit what the machine will do. It is now arranged with fixed wings and does not display what can be done by hinging them on a vertical pivot.

September 17—Wind from N, 17 m.p.h. at 8 a.m. decreasing to 12 m.p.h. at noon. Got Paul's machine up the hill and onto the ways. Tested it for fit and rigged it as a kite with a bridle leading down to a long rope to a post 250 ft. from the chute, then at right angles through a sheave to serve as the main line. With two side guy lines fastened to the wings and with loose rope hanging from front and rear to change the angle if required.

All being manned, O. C. cut the rope at 12:35 p.m. Machine slid down the ways and took the air fair and level. Went horizontally 15 or 20 ft. and then (being checked by friction of the main rope in the sand which the crew did not haul in fast enough) it settled down squarely forward and westward to the ground, landing on its keel about 100 ft. from end of chute. One wing struck the ground but was not broken. Found a broken stanchion at keel but so little damage done that it was all repaired in two hours, by which time the wind had become so light that the machine could not be sent off again. Took it back to tent.

This experiment seemed to indicate that the apparatus is stable and will not come down so as to endanger the operator. It was loaded with 130 lb. of sand in bags and got in a region of comparative calm as soon as it dropped beyond the brow of the hill. The experiment should be tried again in a wind of 25 m.p.h.

September 23—Gale blew itself out in night and returned to S wind by morning. Got Paul's machine up the hill and tried to raise it as a kite, first from the sand and then from the trestle. Found the wind not strong enough; then tested the machine the whole length of chute for fit of sliding shoes and took machine back to camp. In p.m. tested keels on both 2-winged and 10-winged machines but the exposure was bad for the South wind.

September 26—SW gale ceased in night. Very still in a.m. Indications of a North wind. Got ready to test Paul's machine. By 3 p.m. wind up to 18 m.p.h. Paul in machine and all ready. Cut the rope at 3 p.m. Wind turned to NE. Machine slid slowly down the chute and stopped on level portion, the two forward shoes clear of the slide. This must be due to friction on slide consequent of side wind. Fastened rope to back of machine and hauled it back on top of slide.

Told Paul to get out before hauling back. Substituted 90-lb. ballast. Sent machine off again at 3:31 p.m. As soon as the front of the machine had fairly left the chute, the side wind blew the head around and the apparatus took a descending SW course, describing a curved path. The left wing struck the trees west of chute, the tip struck the sand, and the wing was broken, this being chiefly in the main center area. The machine fell to the ground and a number of wings and stanchions were broken. The rattan did not break. If a man had been in the machine, he would not have been hurt, but this trial determined clearly that the machine will not perform soaring flight, that it will glide downward only, probably at a maximum angle of 1 in 4 as shown by calculations, and that the head resistance adrift must be reduced so as to give a descent of 1 in 10 (6°) before it can be hoped to raise on the wind higher than the starting point. This has not been accomplished with any of the three machines. (End of Chanute's diary.)

(Continued on next page)

Epilogue

Ricketts—Went on to be a successful Chicago physician. Told one of his friends in 1911 that it always seemed so amazing to him that, with the whole world so crazy about flying and all the young men anxious to be up in the air, he had been one of the first to glide through the air and there was no person in the world less interested in flight than he.

Avery—The best résumé of his activities is an interview in the *Chicago Daily News* of October 4, 1940, when he was over 70. He recalls how he built the first plane in the attic of Chanute's house in Chicago. He also kept a diary, and under June 23, 1896, he wrote: "My first flight on flying machine this morning." This one is one listed in the Lilienthal machine as "a number of fair glides."

Herring—In spite of disagreements, Chanute continued to correspond with Herring until his letter to the Wrights on December 26, 1903. On November 21, 1897, Chanute sent him records of the lengths of the glides on September 11—359 ft. He sent him photos of sea gulls from San Diego and wrote him a reference in 1901. In March, 1901, Chanute had a bit of correspondence with Herring and his patron Arnot about giving Herring more credit in the McClure article and in the *Encyclopedia Brittanica*. In 1902 Chanute hired Herring to rebuild the 12-winged machine and send it to Kitty Hawk. He took Herring to Kitty Hawk from September 27 to October 17, 1902. Wrights did not want him around without Chanute; liked Spratt. December 26, 1903, Herring wrote to the Wrights and wanted a share in their future profits. Was in almost continuous litigation from then on until 1909.

Butusov—Chanute wrote to Moy on November 10, 1896. "The machine of William Paul did not prove a success. Paul is anxious to continue experimenting and I am anxious to lend him one of my machines under such safeguards as will preclude accidents. I do not want to be connected to it in any way, as I propose to confine myself to scientific experiments and have no commercial applications. Paul's principal object is to develop circling flight in a wind; he thinks he knows how the sailing birds do it.

In 1897, Butusov made another machine and took it to Miller station to make a flight and surprise Mr. Chanute. In the flight Butusov fell from 70 ft. and was paralyzed 2 years. They had a joint patent (No. 606,187, dated June 28, 1898.)

After Chanute's death in 1910, the Chanute heirs conveyed over to Butusov their father's interest in the patent. On April 16, 1911, a *Chicago Tribune* reporter had an interview with Butusov and printed his photograph. Butusov not only claimed he was the father of the aeroplane, but he said he had made a flying machine to enter the contest for a $50,000 prize offered by the Aero Club of Illinois.

Chanute—He wrote up several accounts of his gliding experiments. One of the best was delivered October 20, 1897. A very complete account is given under "Experiments in Flying" in *McClure's Magazine* of June, 1900.

On October 6, 1899, Chanute wrote to Spratt: "I worked out a theory of soaring flight 2 years ago but delayed publishing it with required mathematical computations until I had experimental data to support convictions and produce a model that will exhibit at every trial the effects announced."

That sort of caution is the keynote of his life. I asked an old professor at the University of Illinois who had heard Chanute speak what his impression was. He said: "The one that stayed with me is that he never opened his mouth to say anything unless he was absolutely sure of his facts." That might be a good model for all speakers and writers, even historical ones.

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In April, 1896, just as Chanute was getting ready to go to the dunes, he received a request from the Acting Secretary of the Smithsonian, J. Brown Goode, for an appraisal of Dr. Langley's work in aeronautics. He replied April 10: "When I was in Europe in 1889 there was much disagreement on aerodynamics. There was a project being discussed in France about providing an air current with an enormous blower fan. Lilienthal and Phillips have since shown that concave curved surfaces are more efficient forms. It is very much to be desired that Dr. Langley should next publish some data concerning such forms. . . . ."

Thinking over this subject of credit, he added some more general thoughts to Mr. Goode on April 13, 1896: "The practical development of a scientific truth is somewhat like the growth from a new seed. We recognize the assistance of the plant, we ascertain some of its virtues, but we cannot tell the full uses, how soon it will mature, nor how large the tree will be."

In an article in the *Chicago Sunday Times-Herald* of July 30, 1899, which seems to be based on Chanute's glides of 1896 and 1897, the reporter ends with a direct quotation from Octave Chanute: "I believe that no one man will invent a marketable flying machine properly so called. The commercial machine will be developed by a process of evolution, one experimenter finding his way to certain definite results, the next overcoming some of the remaining difficulties, and so on, until some ingenious man shall add the finishing touches. He will probably obtain the credit of being the true inventor, but his predecessors who shall have pointed out the way may perhaps not all be forgotten. It is believed, however, after many centuries of failure, that we are at last within measurable distance of success in aerial navigation." If I have been able in some part to aid in one of these predecessors not being totally forgotten, it has been well worth while.

The Wright Brothers in the Press

by

MAURICE H. SMITH

Maurice H. Smith, I.A.S. Librarian.

The Institute of Aeronautical Sciences received ten folio scrapbook volumes in 1949 from the estate of Orville Wright, averaging 200 pages each and containing some 14,000 items from newspapers and magazines on the careers of Wilbur and Orville Wright.

On September 18, 1901, Wilbur Wright delivered his modestly titled paper, "Some Aeronautical Experiments," before the Western Society of Engineers. A copy of this paper is found among the first pages of the first volume, marked "1902–1908," and it is followed closely by a copy of "Experiments and Observations in Soaring Flight," read by Wilbur Wright before the same society on June 24, 1903.

The first of these papers had been reprinted in England and the United States in 1902, and the second attracted further attention in Germany and France, where Captain Ferdinand Ferber's gliding experiments are reported by F. de Rue in *Armée et Marine* for August 2, 1903, with some credit to the Wrights for their solution of the control problem and for the design of the biplane glider as used by Ferber.

A convenient date for the actual beginning of the international recognition that was to come to the Wrights is July, 1901, the date of the first publication by Wilbur Wright showing what he and his brother Orville were doing in aeronautics, an article in *Illustrierte Aeronautische Mitteilungen*, Vol. 5, July, 1901, entitled "Die wagerechte Lage während des Gleitfluges." The advantage of having the pilot lie on the glider, supported by its structure and acting as part of it, is pointed out, and there is a hint that lateral stability may be solved by a method better than the swinging of the pilot's body as he hangs supported by his arms, the method previously used by Lilienthal, Chanute, Pilcher, and others. In the suggested prone position, his arms are not using all their strength to hang on, and experiments on a sandy seashore by the Wrights have proved that landings can be made without injury at speeds as high as 25 m.p.h. It is further pointed out that the greater part of the glider's useful time is spent in the air rather than in the take-off and landing, and during this important time the pilot should be free to manipulate it. The experiments of 1900 are illustrated by a picture of the glider in the air as a kite.

In the period before the first powered flights, the reputation of the Wrights grew both here and in Europe. The *Dayton Journal* of January 25, 1902, carried a full page on their soaring experiments, and clippings from the *Scientific American* for February 22, 1902, the *Illustrated Scientific News* for February, 1903, *Illustrierte Zeitung* for March 5, 1903, *Le Monde Illustre* for March 28, 1903, *Die Zeit* (Vienna) for September 19, 1903, and *The Globe* (London) for October 16, 1903, are to be found in the scrapbooks.

The little German article of July, 1901, received less attention than the two later papers given by Wilbur Wright before the Western Society of Engineers, which were the principal source of background information after the flights of December 17, 1903. Clipping after clipping shows direct quotation from these articles.

Fred C. Kelly, official biographer of the Wrights, has ably analyzed the coverage of their flights of 1903, 1904, and 1905 by newspapers, or rather the lack of coverage. Two documents in the first scrapbook are connected with the flights of December 17, 1903. One is a 3-page typed copy of the correct story of the flights as issued by the Wrights after their return to Dayton from Kitty Hawk. The other, which must have been written before they went to Kitty Hawk, consists of 2 pages in Wilbur Wright's handwriting describing the airplane as in the announcement issued by Bishop Milton Wright after receiving Orville's telegram of December 17.

Accurate printed information about the experiments of the Wrights was certainly scarce before their Kitty Hawk flights in May, 1908. Though there are 7 pages of clippings for 1903, 11 for 1904, 7 for 1905, 22 for 1906, and 14 for 1907, it is not until 1908, when 177 pages of clippings are found, that the situation begins to clear. Newspaper coverage of the Wrights from that point on, including obituaries of Orville Wright in January, 1948, takes up some 1,800 folio pages of clippings.

But there is conscientious historical material in the barren period.

The articles of Sherman Morse in the *New York Herald* for November 22, 25, and 29, 1906, based on his assignment of several days in Dayton with the Wrights, offer the best summaries of their achievements as of that time and state exactly how they felt about publicity, their airplane, and its future. The *St. Louis Republican* for March 11, 1906, carries a story by Charles W. Wood based on his special assignment in Dayton, and the statement of F. S. Lahm in the *Paris Herald* of February 10, 1907, is based on painstaking field research partly reported previously in the issue for January 1, 1906. Arthur Ruhl, writing in *Colliers Weekly* in May, 1908, saw some of the flights of that month at Kitty Hawk, and George Kibbe Turner spent an entire morning with the Wrights before writing his article published in *McClure's Magazine* for February, 1908.

The official announcement of the Wrights to the Aero Club of America of March 12, 1906, and their letter of November 17, 1906, to the Editor of *L'Aerophile*, which aroused great interest in France, are reflected in the scrapbooks. Statements by such persons as Octave Chanute and Alexander Graham Bell during this period of skepticism were welcomed by the press.

E. B. Grimes, writing in the *Technical World* for June, 1906, had talked with the Wrights, but the sketch accompanying the article shows five superimposed wings and two propellers under the machine. The caption says: "The sketch from which this drawing was made has been seen by the inventors." On the extreme debit side, aside from the purely imaginary stories of the 1903 flights, are the "three instantaneous photographs of the Wright flying machine, taken while it was in actual flight," in the *Christian Herald* for January 6, 1904, showing a Chanute glider with the pilot dangling.

The Hart O. Berg collection, received in 1939, originally consisted of nine volumes and has grown to 14. The volumes are 10 by 15 in., and there are about 2,000 clippings in the collection. Hart O. Berg, the European representative of the Wrights, was born in Philadelphia in 1865 and died in New York in 1941, but most of his life was spent in Europe. He pioneered in automobile manufacturing in France as Chief Engineer of Clement-Bayard, and in 1902 his own company was making automobiles in the United Sates. He was instrumental in developing the Browning machine gun and the Browning pistol and built the first oil cracking plant in Europe just before World War I. He organized the first Wright company in France in 1908, as representative of the Wright brothers in Europe. In 1908, he handled business details and arrangements when Wilbur Wright went to France to astound the world with his flights at Le Mans, Pau, and Rome and a year later when Orville Wright made demonstration flights in Berlin.

The Hart O. Berg collection is strong in European newspaper clippings, especially from France, Germany, and England, and there are four albums of photographs covering the activities of the Wrights in Europe in 1908 and 1909. Much has been added to these volumes since they were originally organized by Comdr. (now Adm.) Luis de Florez, who was designated by Mr. Berg to take this responsibility. Some additions have been a list of the books sent by Octave Chanute to the Wrights, compiled from Chanute's correspondence; copies of the *West Side News;* the *Evening Item*, published by Orville Wright in the 1890's; and a considerable number of clippings. There is a letter to Robert R. Dexter, Secretary of I.A.S., replying to an inquiry about the fuel capacity and fuel consumption of the 1903 airplane:

June 20, 1944

"Dear Mr. Dexter:

"I find from our records that the gasoline tank on the Kitty Hawk plane held four-tenths (0.4) of a gallon. The motor consumed gas at the rate of $1^{1}/_{3}$ gallons per hour, or 1 gallon in 45 minutes.

"Sincerely yours,
(Signed)
"Orville Wright"

Brochures of the Wright Company and the Wright-Martin Aircraft Company, describing "Wright fliers" in 1910, 1911, and 1916; contemporary postcards; magazine articles; reprints and originals of articles by the Wrights; and some manuscripts are included. There is, for example, a holograph copy of his remarkably inaccurate report of the first man-carrying flight, made by Harry P. Moore in 1940 for Fred C. Kelly, and some correspondence with regard to it. Clippings on the dedications of the Kitty Hawk monument in 1928 and the memorial rock and tablet there in 1933; the dedication of the restored Wright brothers' home and shop at Greenfield Village, in 1938; and the dedication of Wright Brothers Hill at Wright Field, Dayton, Ohio (now Wright-Patterson Air Force Base) on August 19, 1940, are among the memorial events fully covered in this collection. On one of the bronze tablets at the last site are listed all the persons who learned to fly there under the Wright brothers, and a close-up photograph of these names is a useful historical document.

Gleanings in Bee Culture, published in Medina, Ohio, by the A. I. Root Company, mentions the flights of 1904 and 1905 nine times. Some of the longer articles appear in the scrapbooks, but I.A.S. also has a file from Vol. 32, No. 5, March 1, 1904, through Vol. 33, No. 23, December 1, 1905, of all the issues mentioning the Wrights, in a separate volume.

Issues of this little magazine for March 1, 1904, and January 1 and 15, 1905, are included in a volume bound in limp blue leather, collected by F. S. Lahm and given to I.A.S. by his son, Brig. Gen. Frank P. Lahm. This volume contains a number of letters dated 1906 and 1931, including The Wright Cycle Company (per O. W.) to H. M. Weaver, December 4, 1905; Orville Wright to F. S. Lahm, July 5, 1930 (3 pages, mostly regarding the flights of 1904 and 1905); O. F. Jamieson to F. S. Lahm, January 8, 1906; and F. N. Waddell to F. S. Lahm, January 9, 1906. Other letters, dated 1931, all notarized and confirming the flights of 1904 and 1905, are from Howard M. Myers, Wm. Webbert, Edgar W. Ellis, C. E. Taylor, Frank Hamburger, and G. A. Feight.

An insight into the conduct of aviation exhibitions in 1910 and 1911 is furnished by drafts or carbons of some 95 contracts between the Wright Company and various state fairs during those years, received from A. Roy Knabenshue, who was exhibition manager for the company. Source documentation on flights of Wright planes during this same period is found in some 60 field reports, signed by Frank T. Coffyn, of which I.A.S. has photostat copies.

43 70

Gifts

Among the items that have been given to the Museum recently is an interesting plate with aviation motif given by William Schinck.

Mrs. Albert Stevens, widow of the late Captain Stevens, famous aerial photographer, has sent us some handsome photographs from her collection—a most welcome addition to the Archives.

Glenn L. Martin increased our display of aviation models by sending a new model of the Martin 2-0-2 and also the Martin XP4M-1 or Mercator.

We are trying to keep our collection of models as up to date as possible and are dependent on gifts such as these to do so. Any such additions are most welcome and will keep our displays current, as well as fill in any gaps that we might have.

(*Continued from page 1*)

tended by 47 Historical Associate Members and their guests and included as guest of honor, Roy Knabenshue, an early aeronaut and balloon builder. Miss Young made mention of the vast amount of correspondence between Chanute and Knabenshue in the period from 1895 to 1910.

Also present as special guests were Dr. J. S. B. Carruthers, owner of a fine collection of books on aeronautical history which recently has been placed in the Claremont University Library; Prof. Robert Craig, of the University of Southern California Aviation Department; and Garey Carr, author of a book soon to be released entitled *100 Years of Aviation in California*.

Miss Young also spoke on June 29 on the subject of "The Fluent Engineer." Her background prepares her well for such a subject, since she served as Technical Editor and Physicist for N.A.C.A. before turning to education.

She is now Assistant Professor of Physics at The Pennsylvania State College.

Aeronautica

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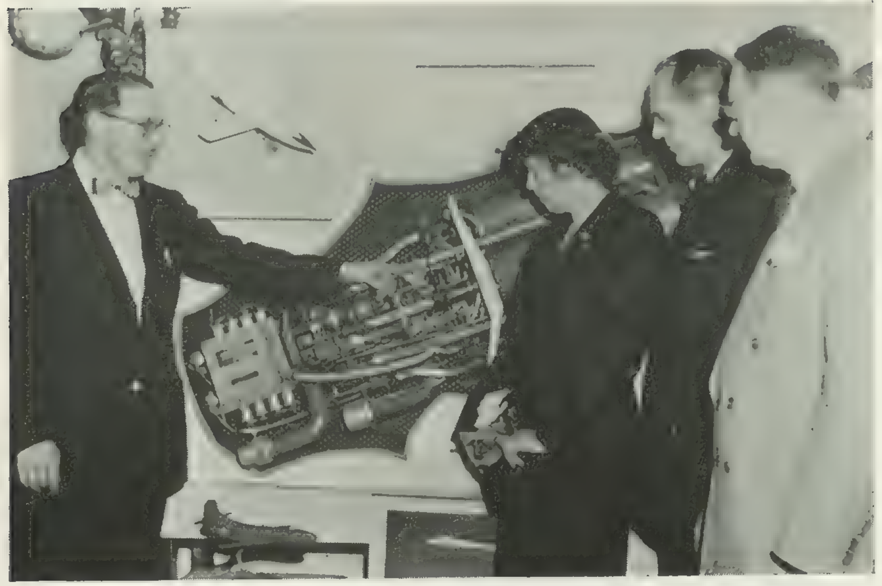

Left to Right: **Lovell Lawrence, Jr., President, Reaction Motors, Inc.; Mrs. Robert H. Goddard; Dr. Howard B. Jefferson, President, Clark University; Francis W. Roys, Dean of Engineering, Worcester Polytechnic Institute.**

Goddard Memorial Exhibit Opens

Mrs. Esther Goddard Is Honored at Reception and Luncheon.

December 1, 1950, marked the opening of the Goddard Memorial Exhibit at the Institute museum. Mrs. Esther Goddard came down from Worcester to open officially the exhibit, which contains equipment and apparatus used by the late Dr. Robert H. Goddard in his pioneering work on rockets. Through the kindness of Mrs. Goddard, this collection was given to the Institute and will remain as a permanent part of the I.A.S. Archives.

A reception was held for many friends of Mrs. Goddard, members of the American Rocket Society, and those interested in her husband's work. Also present were members of the I.A.S. Council and Staff. This was followed by a buffet luncheon, and the exhibit was opened to the public later in the afternoon. Among those present were Harry F. Guggenheim, without whose aid, through the Guggenheim Foundation, much of Dr. Goddard's work could not have been carried on; Lawrence Rockefeller; Dr. Charles G. Abbot, Secretary Emeritus, of the Smithsonian Institution, which sponsored much of Goddard's early work; Dr. and Mrs. Howard B. Jefferson, President of Clark University where Dr. Goddard started his early work; Dr. and Mrs. C. N. Hickman (Dr. Hickman did much of the early powder rocket work); and the men who worked with Dr. Goddard and are carrying on their work in rockets with the Rocket Department at the Curtiss-Wright Corporation. We also had with us representatives of the Navy, of Reaction Motors, and of the Aerojet Engineering Company.

The exhibit is divided into four sections that correspond to similar periods in the life of the inventor. The first panel covers his work in solid fuel pro-

(Continued on page 8)

Re Aeronautica

This issue is devoted largely to Dr. Robert H. Goddard—his life and his work. We are fortunate indeed to have the material available for exhibit so that more may know of his achievements and contributions. We urge all Historical Associate members and their friends to visit the new exhibit and feel sure that they will be amply rewarded.

We are pleased to report that interest in the Archives is growing, and that many I.A.S. members are joining the ranks as H.A. members. Our mailing list now numbers over 525. After receiving their first copy of Aeronautica, perhaps some of the new members have suggestions, questions, or comments. Please mail these directly to Aeronautica, 2 E. 64th St., New York 21, N.Y.

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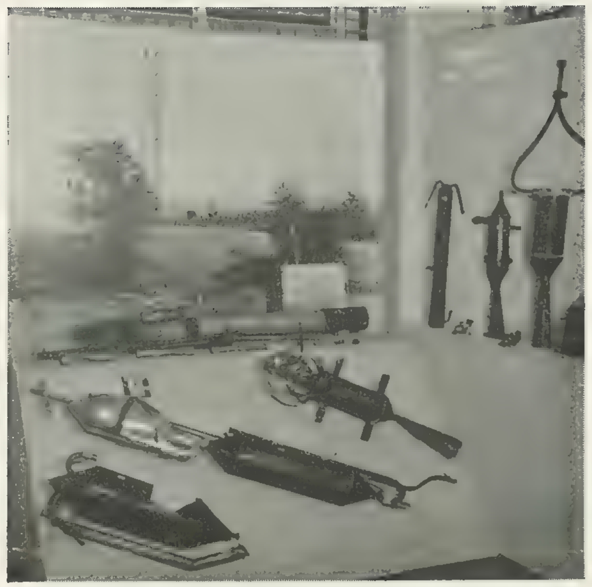
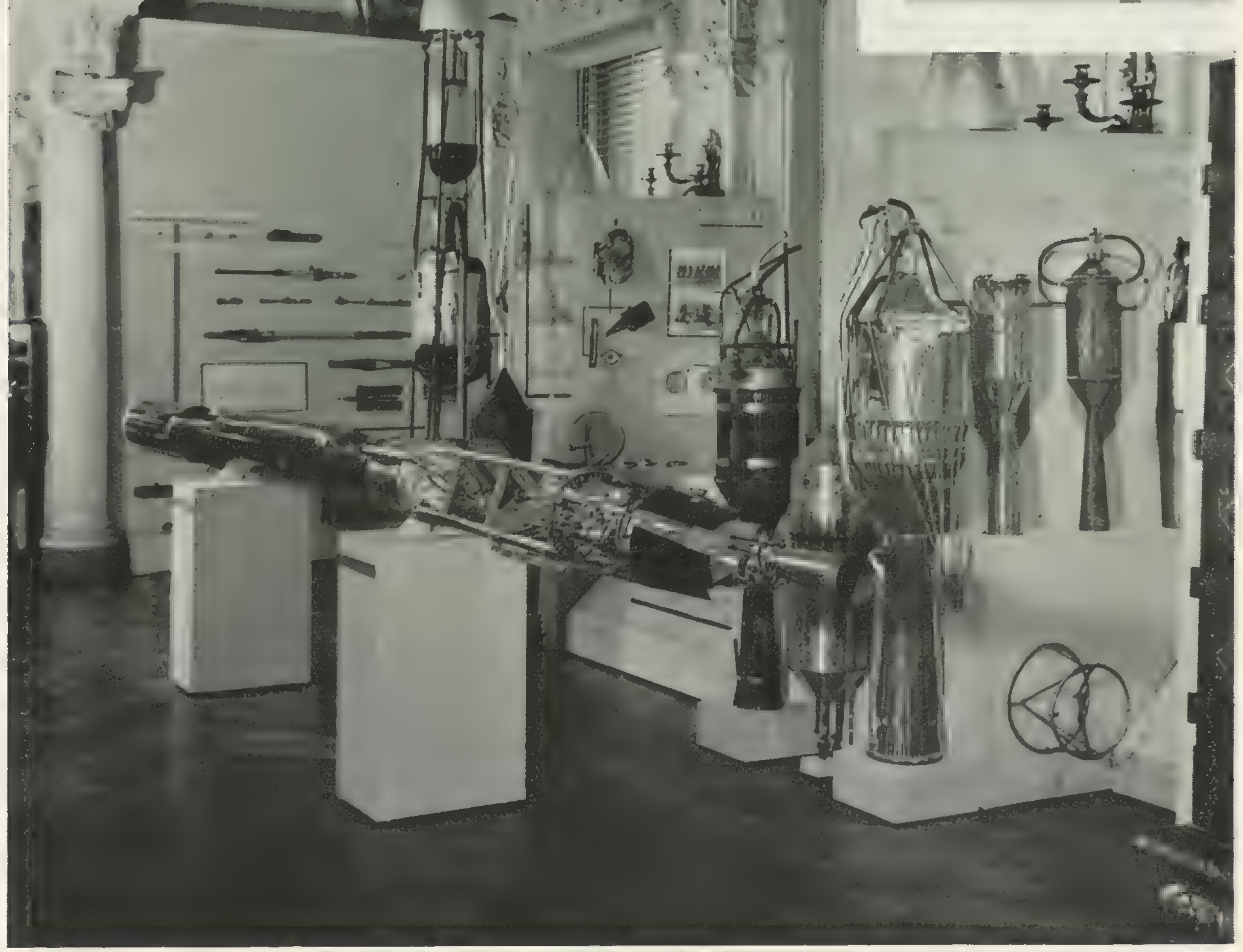
The Robert H. Goddard Memorial Exhibit



(Top) A portion of the collection, devoted to experiments carried on at Auburn between 1918 and 1929.

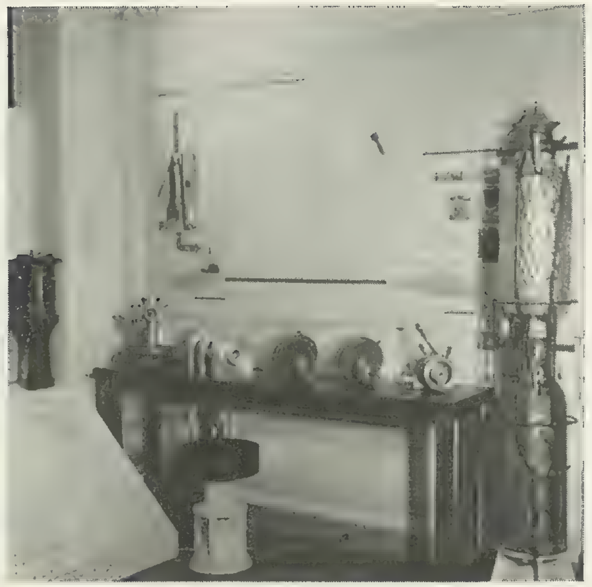
(Below) General view showing approximately half of the exhibit. Full-size rocket in the foreground is type used in experiments of 1936–1938.



The Robert H. Goddard Memorial Exhibit, made possible through the donation by Mrs. Esther C. Goddard of the library and apparatus used by her late husband, has now been established as a permanent part of the Aeronautical Archives of the Institute.

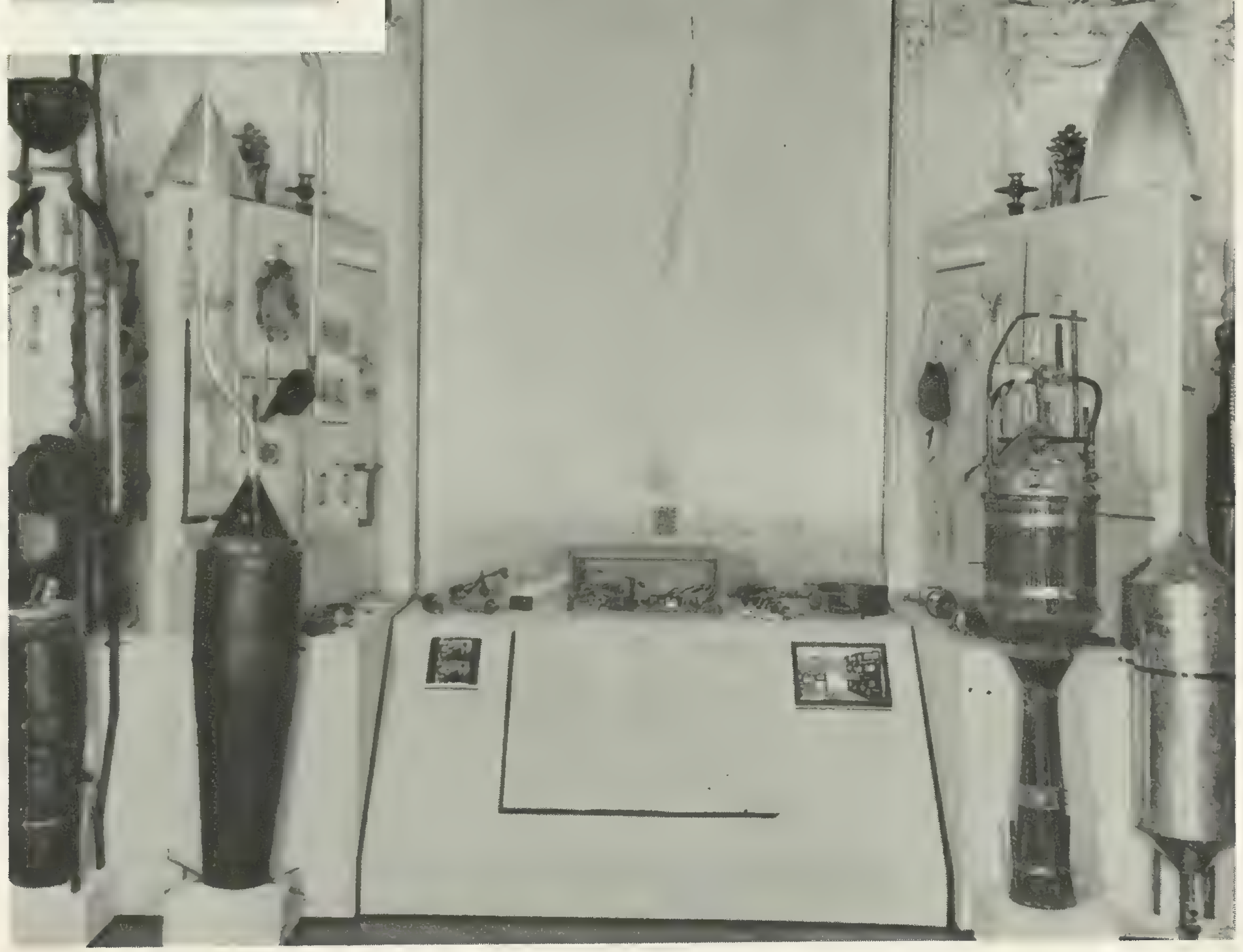
To mark the opening of the exhibit on December 1, 1950, a buffet luncheon and reception was held at the Institute building, at which time Mrs. Goddard officially turned over the exhibit to the I.A.S. The reception was attended by friends and admirers of Dr. and Mrs. Goddard, some of whom had worked with Dr. Goddard. A number of members of the American Rocket Society and members of the I.A.S. staff were also present.

The Robert H. Goddard Memorial Exhibit, as well as the rest of the Aeronautical Museum, is open to the public from 10:00 to 4:00 on weekdays.



(Top) This panel illustrates the fact that the German V-2's incorporated many of Dr. Goddard's ideas and inventions.

(Below) Centered around a picture of the successful L-14 launching, in 1937, are displayed items connected with Goddard's work at Roswell, N.M., 1930–1941.



Robert H. Goddard
—a Biography

From "Rocket Development," by Robert H. Goddard; Esther C. Goddard and G. Edward Pendray (Eds.), Prentice-Hall, Inc., New York, 1948. Copyright 1948 by Esther C. Goddard.*

DR. ROBERT H. GODDARD "was born in Worcester, Mass., October 5, 1882. His early schooling was obtained in Boston, where he lived until he was sixteen. His college work was taken at Worcester; he was graduated from Worcester Polytechnic Institute in 1908 and became an instructor in physics there while pursuing graduate studies at Clark University. He received his M.A. degree from Clark in 1910 and his Ph.D. in 1911. He later joined the Clark faculty, where he rose from instructor to assistant professor and, finally, to full professor. He continued to be connected with Clark until 1943, part of the time on leaves of absence.

"As a young professor of physics, Dr. Goddard made important studies on the conduction of electricity in powders, the development of crystal rectifiers, the balancing of airplanes, and the production of gases by electrical discharges in vacuum tubes.

"In the 1912–1913 season he served as research fellow at Princeton University. During this period he produced the first laboratory demonstration of mechanical force from a 'displacement current' in a magnetic field.

"These investigations, however, were only more or less incidental to the real interest and accomplishment of his life. As early as 1899, when he was only seventeen, he began to speculate about conditions in the upper atmosphere and beyond and to evaluate various proposed methods of reaching these regions physically, for exploration. A notebook of his, dating back to October 19, 1899, contains such speculations and mentions the possibility of employing rockets for this work.

"In 1907 he prepared and submitted for publication a manuscript suggesting that heat from radioactive materials could be used to expel substances at high velocity from an orifice, thus furnishing jet propulsion sufficient to navigate an interplanetary space. The manuscript, still in existence, is an interesting document. It was ahead of its time, however, and was forthrightly refused when Dr. Goddard submitted it seriatim to the *Scientific American*, *Popular Science Monthly*, and *Popular Astronomy*.

"The idea of using hydrogen and oxygen as fuels for an interplanetary rocket and the construction of such a rocket according to the multiple or step-rocket principle occurred to him in 1909. After considerable calculation he put the theory into satisfactory form in the winter of 1912–1913. His computations included the possible use of smokeless powder for the propellant, as well as hydrogen and oxygen.

"His actual experimental work began about 1914, upon his return to Clark University as an instructor and honorary fellow in physics. The first tests were made with various types of ship rockets and were continued with larger solid-fuel rockets" that he constructed.

"By 1916 he had nearly reached the limit of what he could do with his own resources. In that year he began to seek support for his work, his principal instrument of solicitation being a lengthy technical paper he had prepared on rocket possibilities which he submitted to several foundations and other prospective donors.

"It was as a result of sending this paper to Dr. Charles D. Walcott, then secretary of the Smithsonian Institution, that he obtained his first grant of funds from that source. Most of his paper was later incorporated in the report entitled 'A Method of Reaching Extreme Altitudes,' published in 1919 as a part of the *Smithsonian Miscellaneous Collections*, Vol. 71, No. 2. It has since been republished by the American Rocket Society in book form.

"Total grants from the Smithsonian amounted to about $11,000. With this small sum Dr. Goddard laid the foundation for virtually all of his later achievements and initiated the world-wide interest in rockets and jet propulsion which has become of major importance not only to scientists and engineers but to all men and nations.

"After the entry of the United States into World War I in 1917, Dr. Goddard was assigned to explore the military possibilities of rockets. He succeeded in developing a number of promising military rocket devices. One of these was a rocket for long-range bombardment, the motor of which operated intermittently during flight, solid-fuel propellant charges being injected rapidly into the combustion chamber by a method similar to that used in loading repeating rifles.

"He also developed several types of relatively short-range rocket projectiles intended to be fired by infantrymen at tanks or other military objectives, the firing mechanism being a simple launching tube held in the hands and steadied by two short legs. Some of these devices were in many respects similar to the 'Bazooka' of World War II and were, of course, that weapon's progenitors.†

"A number of these new weapons were demonstrated at the Aberdeen Proving Ground on November 10, 1918, before representatives of the Signal Corps, the Air Corps, the Army Ordnance, and others. The demonstrations went off quite successfully, and the Air Corps representatives particularly expressed interest in continuance of the work, with experimental trials of Goddard rockets in actual combat. The Armistice next day put an end to the war, however, and also ended Army interest in rocket experiments for more than 20 years.

"Dr. Goddard eagerly returned to his work on the development of high-altitude rockets, and the following 10 years saw rapid progress. In that fruitful decade he first successfully used liquid fuels for rocket propulsion and developed simple flight rockets powered by this means. He made the beginnings of rocket flight control by gyroscope, the first application of instruments to record conditions on the rocket during flight, and many other significant contributions.

"The period culminated in the rocket flight of July 17, 1929. . . . The importance of this shot was not so much its success as a flight—though within the experimental meaning of the term it was successful—as in the attention it aroused. It led to near disaster and also, through an interesting chain of events, to more adequate support of Dr. Goddard's work.

"The flight of July 17, 1929, was the last of a series of tests conducted at a site on the farm of a relative, Miss Effie Ward, at Auburn, Mass. In his notes Dr. Goddard designated this series thus: 'Test of Medium-Sized Rocket Having High Center of Gravity and Low Center of Air Resistance.'

"The total length of the rocket was 11 ft. 6 in., its greatest width 26 in., and its total weight, empty, about 32 lbs. It was launched from a metal tower 60 ft. high, the rocket being guided up the tower by two $^{3}/_{8}$-in. vertical pipes. As propellants, 14 lbs. of gasoline were used and 11 lbs. of liquid oxygen. The rocket carried an aneroid barometer, a thermometer, and a camera focused on both of these instruments, to be operated by a trip lever at the time of ejection of the parachute.

"The rocket fired a total of $18^{1}/_{2}$ sec. It rose about 90 ft. above the ground and flew a horizontal distance of 171 ft.

"In this short flight it made a . . . considerable noise—sufficient to alarm the neighborhood. Evidently that July 17 was the kind of day on which sound travels well, for no such attention had been attracted by numerous previous tests at the same spot of approximately equal noise and duration. But on this occasion neighbors sent in calls for ambulances, believing that an airplane had caught fire and crashed. Two police ambulances searched through Auburn for victims. An airplane was sent to investigate. As a result of all this commotion the shot produced an astonishing amount of publicity."

"The sequels are most interesting. One of them was that Dr. Goddard was requested to call on the Massachusetts State Fire Marshal and explain, with the result he recounts in his text. A much happier sequel also occurred. The attention of Col. Charles A. Lindbergh was attracted to Dr. Goddard's work and Colonel Lindbergh brought it to the notice of Harry F. Guggenheim and his father, Daniel Guggenheim. There followed an arrangement for financing the work which made possible" his later accomplishments.

"Dr. Goddard's work on the development of rockets falls into four well-defined periods.

"The first, extending from 1899 until after World War I, was one of speculation, mathematical and theoretical development, and experiment with solid-fuel propellants.

"The second, financed by the Smithsonian Institution and Clark University, comprised the years from the end of World War I until . . . July 17, 1929. In this period Dr. Goddard laid the experimental basis for his subsequent work and demonstrated the feasibility of liquid propellants for rockets.

"The third was the period from 1929 to 1941, financed principally by Daniel Guggenheim and later by The Daniel and Florence Guggenheim Foundation, during which the experimenter made great strides in the development and flight of large gyro-controlled, pump-operated liquid-fuel rockets and all but had within his grasp the long-range and high-altitude flights toward which he had been working, the feasibility of which later was so dramatically demonstrated by the Nazis in their 250-mile, 12-ton V-2 rockets.

"The fourth period comprises the time from the beginning of World War II until Dr. Goddard's death on August 10, 1945, during which he worked on important . . . rocket projects at the Naval Engineering Experiment Station at Annapolis, Md.

"The enormous volume of work he accomplished during his lifetime is the more remarkable in view of the fact that he was a lifelong sufferer from tuberculosis, which first became manifest in early manhood. Not only was there ill-health to combat, but he was hampered by lack of sufficient funds during a large part of his productive life. Added to this was the constant skepticism of the technical world generally toward rockets and the sensational distorted publicity and ridicule that from time to time burst into the press.

"Dr. Goddard was to strangers a quiet, sensitive, scholarly man, reluctant to draw attention to himself. To intimates he was warm, friendly, witty, and unruffled in spite of all obstacles and discouragements. He was an accomplished pianist and enjoyed playing for his own and his friends' entertainment. He was also an artist of ability, painting in both water colors and oils.

"In addition to his active technical imagination and his overwhelming interest in rockets, he possessed two qualities that were of utmost importance in his work. He was persistent, and he was methodical. To the first of these qualities is owed his steady, determined progress in a field so complex that probably no other engineering area exceeds it for difficulty. To the second the world may long be indebted for clear and precise records of everything he did, and a great deal of what he thought, in connection with his chosen field."

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† "Associated in this work with Dr. Goddard were H. S. Parker and C. N Hickman, then graduate students at Clark University. Dr. Hickman, in 1940, became one of the principal directors of rocket research and development under the National Defense Research Committee."

"Our Nell"

(As Told by Mrs. Robert H. Goddard)

On July 17, 1929, we had a good flight, with the rocket coming down without a parachute and breaking up on impact, as usual. We hunted for as many pieces as we could find—usually a good percentage, at least of the parts that took a lot of time to make. Just as we were about to pack up to leave, we noticed a cloud of dust on the road above the ravine in which we

(Continued on page 8)

The Old Flying Days

An anecdote taken from the archives of the Royal Air Force College, which was used in a speech made by Historical Associate Member, Walter M. Fitch, before the Wichita Section of the I.A.S.

“Captain H. C. Biard, Royal Air Force, describes how, in 1909, at the age of 17, he flew an aeroplane without previous instruction. The scene is laid in England.

“This happened a long time ago. A youngster of 17 had elected to spend his birthday sitting on the railway bank at Brooklands, watching the aviators. That was in 1909.

“After that first visit to Brooklands I could talk and think of nothing but flying. My parents, like most other sane people then, thought flying a crazy method of committing suicide. Consequently, when I insisted that I must learn to fly, even if they cut me off for it, we said a last goodbye, just in case. Then, with a high heart, I sped to Mr. Graham-White's new flying school at Hendon, as a pupil.

“Hendon, as I like to remember it, was a field-spread, well-wooded expanse, with hangars spreading like black rash on the skin of the patient earth. Queer, gigantic box-kite shapes were surrounded by curious onlookers in top-hats. Horse-omnibuses, hansoms hourly brought up more and more spectators, all anxious to see a record made, or a flying-crank crash to his death—and you might have seen either, any lucky day in 1910 at Hendon!

“Among the sightseers moved serious, business-like men, some hurrying urgently, and others at ease in tight-belted overcoats and caps whose peaks were worn behind.

“I was there too, whom nobody seemed to want.

“My first day at the school resulted in nothing but the shy purchase of a check-cap, an exact copy of Mr. Graham-White's own. But having bought it, I was ashamed to wear it and stuffed it in my pocket.

“Ask as I might, there seemed no job for me to do and no instructor to advise me. Everyone was hurrying about on some mysterious errand of his own and had only time to make vague suggestions when I inquired. I was like a boy on the first day of school.

“On my second morning there I became desperate. I was already 18. If I waited much longer I should be an old man. Plucking up courage I took a passing mechanic firmly by the sleeve.

“ ‘Is *my* machine ready?’ I asked.

“ ‘You'll have to ask the works manager, sir,’ he replied, with that noticeable politeness reserved in those days for the few men who had really flown.

“I found my way to a large, genial, busy man in overalls outside one of the hangars. ‘Is *my* machine ready?’

“Luck was with me that day. He was expecting an experienced flier who had ordered a plane but personally was unknown to him. He assumed that I was his man.

“ ‘They're just shoving her out now,’ he said, nodding towards a couple of mechanics, who were hauling a big box-kite aeroplane out of a row into a clear space in front.

43 70

“ ‘Got everything?’

“I nodded. I could not trust myself to speak.

“A wonderful idea had come, like a heavenly inspiration, into my mind. For years I had read everything I could about aeroplanes. The machine of 1909 and 1910 was a simple thing. Two wings were supported by a wire framework, which also carried the tail. The sole controls were the joy-stick and the engine switch. There was no throttle. You just switched full on or off. I had read many descriptions of the way you handled the joy-stick to control the machine. How about getting on to this one and having a shot at this flying?

“I knew that, if I said I had not received a single word of practical training at the school, they would keep me out of a real flying machine for weeks.

“I nodded carelessly to the works manager, though to this day I do not know what he meant by asking if I had ‘got everything.’

“I walked over to the machine, climbed up through the wires, seated myself in the saddle, cocked a professional eye at the petrol-tank behind my head, and put one hand on the joy-stick, thrilling at its cool, smooth touch. One of the men leaned in and switched on the engine; as he jumped back to earth, the other swung my propeller.

“Before I could adjust my thoughts the green earth was running with smooth, nightmare swiftness under my feet. The engine roared in my ears. I was taxi-ing, faster and faster, past hangars, groups of sightseers, things that became blurs and fled on—and then, right smack in my path, I saw a machine at rest on the ground. Instinctively, in my shock, I dragged at the joy-stick. Nothing happened, save that the machine ahead jumped at me, grew big and threatening.... I shut my eyes for a second, waiting for the crash, and when I opened them the wings of the stationary aircraft were sliding beneath my feet. I was flying.

“The earth receded; people grew small and the hangars dwindled and seemed flat. The air went singing past. The engine roared and throbbed. Suddenly I became aware of the skeleton nose of my machine tilting horribly in front of me. Forward went the joy-stick and the nose sank. My feet, which had risen in front of my nose as we climbed, went down again. I switched off the engine with some hasty idea that I must land. The propeller surprised me because it still whirled in the wind and the air screamed past my ears. The ground floated up at me, there was a terrific wallop, and I glided to a standstill on the extreme edge of the flying field.

“I had flown successfully for 2 miles.

“I jumped out like a flash. We had to pay for our breakages, and I was scared that my landing was going to cost me something dreadful. But no! The machine was undamaged. Even the big bicycle-type wheels were intact.

“ ‘First flight alone?’ asked a grinning mechanic, who had run out of a hangar near by as a I descended—perhaps with the idea of avoiding death in the ruins.

“I nodded.

“ ‘Thought so,’ he said. ‘You flew dead straight across the ’drome, and that landing wasn't too good. Didn't they tell you that you ought to have had someone aboard to make weight until you were used to it?’

“They hadn't of course. He was a helpful sort and volunteered to sit astride the petrol-tank (the only spare seat) while I flew back, because extra weight would make the machine less lively. He hopped into place and I taxied around and got up perfectly, flying back to my starting place and making quite a good landing.

“I was taxi-ing her around again, meaning to make a longer flight with my friend, when the works manager ran up, followed by the man for whom he had mistaken me.

“A noisy scene followed. The works manager abused me for endangering one of his machines. My passenger and friend told me exactly what he thought of me for risking his—to him—valuable life.

“The genuine airman repeated impressively at intervals that it would have served me right if I had broken my young neck.

“What did it matter?

“What did I care?

“I had tried my wings.”

Russia and the Wright Brothers

by Leonard N. Beck

The current Soviet predilection for claiming every invention is interestingly footnoted by two books recently selected for cataloging from the miscellaneous unclassified collections of the Library of Congress. The books, the first (1908) and second (1909) editions of V. F. Naidenov's *Aeroplan Brat'ev Rait*, were obviously inspired by the Wright brothers' presence in Europe. Colonel Naidenov, a distinguished journalist, soldier, and teacher, was also his government's official expert on lighter- and heavier-than-air aeronautics. As a leader of Section VII (Aeronautics) of the Russian Technical Society, he was familiar with the petitions for assistance addressed to the Society in the 1880's by A. F. Mozhaiskii, the Soviet candidate for the place in aviation generally accorded the Wright brothers. Naidenov's lecture on Mozhaiskii to the Officer's Aerostation School and the Mozhaiskii biography that he contributed to the *Military Encyclopedia* are usually cited by Russian writers as proof of their claims.

Naidenov's account of the Wright brothers is straightforward and factual, although rather pedestrian in manner. The immediate interest of the first edition lies in the comment following directly on the description of the Kitty Hawk test of December 17, 1903: “This flight is noteworthy in that it was the first in which man raised himself from the earth in an airplane equipped with a motor. The first flight for us here in Europe is considered to be that of Santos-Dumont on October 23, 1906.

“...Consequently, America, in the person of the Wright brothers, outstripped Europe in aviation by 3 whole years.” In the second edition this paragraph is at once qualified in its scope and shortened in its expression. Naidenov now writes as if halfheartedly championing Europe against all western pretensions, even those of the Brazilian Santos-Dumont. “In this way,” we read, “the Wright brothers in America solved the problem of mechanical flight by the airplane 3 years earlier than in Europe, not considering Ader.” Whatever the real accomplishment of the mysterious Clement Ader, the point remains that Naidenov selected him, rather than Mozhaiskii, as the possible opponent of the Wright brothers' claim to primacy in aviation.

Naidenov does mention Mozhaiskii specifically in another work. In the *Russkoe Vozdukhoplavanie* of 1911, Mozhaiskii is cited as an example of those whose projects were effected or physically realized, but the word “osushchestvleny” in this context obviously means nothing more than that an airplane was built. Since the lecture and the encyclopedia article are in substantial agreement, the focal statement from the latter can be translated here as Naidenov's final word on Mozhaiskii's airplane: “The apparatus lifted itself from the ground but, lacking stability, listed to one side and broke the wing.” The student of aeronautics is reminded of Otto Lilienthal's admonition: “To invent an airplane is nothing; to build one is a great deal; but to make it fly is everything.” Mozhaiskii may have done the “great deal,” but we have Naidenov's testimony that it was not he but the Wright brothers who did the “everything.”

In addition to testifying unwittingly against today's exaggerated Soviet nationalism, Naidenov comments pertinently on the problem of the dissemination of technical information. The reason for Russia's comparative immaturity in aeronautics, for discoveries in theory remaining “only dead letters on paper,” he says, is that “our flying machine inventors usually show the deficiency of being almost completely unacquainted with what has been done and what is being done by others, which is explained by the absence of literature here on this topic.” The librarian is grateful for Naidenov's understanding of the importance of the free circulation of ideas.

Minutes of the Aero Club of America

*By Maurice H. Smith**

Among the unique collections in the custody of I.A.S. are five typewritten volumes of *Minutes of Meetings of the Members and Governors of the Aero Club of America.*

These volumes, which have a special bookplate “Loaned to the Institute of the Aeronautical Sciences by the National Aeronautic Association,” begin with the organizing convention of the National Council of the Affiliated Clubs of the Aero Club of America held on June 22, 1910, and end with the minutes of March 16, 1922, when the vacation of the premises in New York leased by the Aero Club of America was authorized and several steps were taken toward the dissolution of the organization in the interest of a program proposed by its special Committee on Nationalization.

The first officers of the Aero Club of America took up their duties in November, 1905, when the club was incorporated for “the promotion of a social organization or club composed in whole or in part of persons owning aeronautic inventions for personal or private use” and for other purposes including the conduct of meets, contests, and races of “constructions, designed to be propelled or travel through the air or otherwise.” The five volumes of minutes are supplemented by the printed yearbooks, published from 1906 to 1919 (excepting 1918), and by the monthly magazine *Flying*, begun in January, 1912, as the *Bulletin of the Aero Club of America* and claiming to be its official publication through the issue for August, 1915, when this designation was discontinued. A complete file of *Flying* was in the W. A. M. Burden Library when it was moved to the I.A.S. in 1940 and, of course, a complete file of the yearbooks.

Stenographic reports of the 9th, 10th, and 11th annual dinners of the Aero Club of America, held in 1915, 1916, and 1917, accompany the minute books. These contain speeches by such men as Elmer A. Sperry, J. C. Hunsaker, Adm. Robert E. Peary, Alexander Graham Bell, Alberto Santos Dumont, and Gen. Leonard Wood, as well as official awards and other actions taken on these occasions.

Source material of another kind is to be found in some 200 folders of documents and official correspondence of the Aero Club of America and the National Aeronautic Association, including numerous homologation reports to the International Aeronautic Federation (F.A.I.) on various records established between 1922 and 1930. Through these various sources, a continuous official record of the first quarter century of flight is available to the historian.

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* Librarian, I.A.S.

"Our Nell"

(*Continued from page 5*)

worked, which turned out to be caused by a caravan of police cars, ambulance, and press cars. Someone had seen the rocket in flight, had mistaken it for an airplane crashing in flames, and had reported it to the police. Later a plane came over to look for "victims." My husband explained what had really happened and begged that the matter be kept out of the papers, but by the time we reached home extras were coming out. My husband issued a short statement as follows: "The test this afternoon was one of a long series of experiments with rockets using entirely new propellants. There was no attempt to reach the moon or anything of such a spectacular nature. The rocket is normally noisy, possibly enough to attract considerable attention. The test was thoroughly satisfactory; nothing exploded in the air, and there was no damage except incident to landing." Nevertheless, the news reports featured a rocket to the moon that had exploded in mid-air.

One of the graduate students who had assisted at the test came into the laboratory next morning quite perturbed and commented: "They ain't done right by our Nell." The name stuck. All during the New Mexico adventure, and afterwards, the rocket was always "Nell," a member of the family. Always too, when there were drinks at a party, no matter whose name was mentioned as being toasted, my husband's eyes sought mine, even across the room, and our drinks were silently for "Nell."

Goddard Memorial Exhibit Opens

(*Continued from page 1*)

pellants from 1912–1918, showing the culmination in the prototype of the present-day bazooka. The second panel represents the work at Auburn, Mass., with a large photograph of the launching tower at Auburn, as well as one of the first liquid fuel rockets that carried its own weight.

The next period is that in Roswell, N.M. from 1930–1941 and shows the development of instrumentation and control mechanisms with an example of the early use of a simple box camera, thermometer, and barometer as compared to the complicated mechanisms of today. Also included are samples of early parachute releases, gyro stabilizers, and timing devices used at that time. There are numerous examples of combustion chambers showing different cooling devices and methods for injecting fuel.

The next panel illustrates his time at Annapolis from 1941 to 1945 when he was working for the Navy. The material is more scarce here, since a large part of it is still not released, but we do have some examples of different types of oxygen pumps and turbines used in the later liquid fuel rockets. Interspersed in this part of the exhibit are photographs made of the equipment used and also original drawings of designs.

43 70

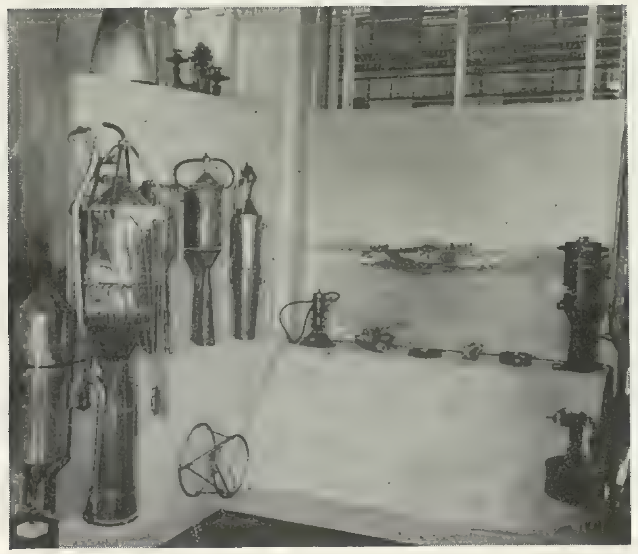
The exhibit is completed by a panel showing pictures of the German V-2's and the damage they did in London during the war. The V-2's incorporate many of the ideas and basic theories of Dr. Goddard.

In addition to this material, Reaction Motors has added a panel to help bring the collection up to date. This shows a modern rocket engine as used in the Bell X-1 and the Douglas Skyrocket. The U.S. Navy will add to the exhibit with a JATO panel.

Dr. Goddard's collection of books and articles on rockets and jet propulsion, included by Mrs. Goddard in the gift, contains more than 250 items, including writings on aerodynamics, liquid oxygen, materials, meteorology, and other topics related to rocket design and rocket flight. There are items in English, French, German, and Russian, including such authors as Robert Esnault-Pelterie, Willy Ley, Hermann Oberth, N. A. Rynin, Eugen Sänger, and K. Ziolkowsky. A number of reprints from such journals as *Maschinenkonstrukteur-Betriebstechnik*, *Auto-Technik*, *Recherches et Inventions*, *Journal de Physique*, *Astronomische Rundschau*, and *Der Zeitungs-Kosmos* were not previously in the I.A.S. Libraries.

Reprints of Dr. Goddard's own papers are also included. These are supplemented by nine volumes of clippings covering Dr. Goddard's rocket activities as reported in the press from 1904 until his death in 1945, with later comments in the press up to 1949. There is a tenth volume of clippings from the press on rockets in general.

This illustrates Dr. Goddard's work under Navy contract. The photograph shows PBY with Goddard Jet Assist.



Scene at the reception and luncheon on December 1, 1950, marking the opening of the Goddard Exhibit.

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Photo courtesy of Warren Bodie, H.A.I.A.S.

Los Angeles H.A.I.A.S. members make recent field trip to Santa Ana. This former Navy blimp base is at present the home of the Paul Mantz collection of historical aircraft. Standing in front of the World War I Sopwith Snipe are *(left to right):* Bob Lynn, Bill Ames, John Sloan, R. B. Johnston, Lee Enich, Joe Barry, Warren Bodie, Emil Strasser, and Gale Bartlett.

Report from the Archives—1950

The following report covers the operations of the Aeronautical Archives of the Institute of the Aeronautical Sciences for 1950.

The organization of the Goddard Memorial Exhibit was the major Archives project for the year. As seen in the last issue of AERONAUTICA, the material makes an attractive and highly informative addition and gives considerably greater coverage to the I.A.S. collections.

The exhibit on the development of mechanical flight, with models illustrating the changes throughout the years, remains in the Museum as a permanent exhibit. There have been some current models given to the Museum, including the Sabrejet and the Skystreak.

Prints, medals, aviation-inspired music, and ceramics, and objets d'art with aeronautical motifs are also contained in the museum, and their arrangement will be subject to further change.

The number of visitors to the Museum has increased with the addition of the rocket exhibit. An indexed pamphlet is given to each visitor, and he is thus able to better identify the objects displayed. A biography of Dr. Goddard is also included. Plans are being made for the preparation of a more formal booklet on the Goddard material.

The Historical Associate membership has taken an upward trend. The count is as follows (through December 31, 1950):

Regular H.A. members	54
I.A.S. members who are also H.A. members	553
AERONAUTICA subscribers	9
Total	616

We hope this increased count of members will mean an increased and continuing interest in Historical Associate membership and the Archives.

Report from the West Coast

July—Robert G. Clark, Executive Vice-Chairman of the Historical Branch, presented a paper on the Ford airplane, the "Tin Goose," and the activities of the Ford Motor Company in the aviation field from 1927–1934. The paper will be printed at a later date.

The members, about a dozen, went to Santa Ana to photograph the Paul Mantz collection of early aircraft, maintained for motion picture work, which includes a rebuilt Curtiss pusher biplane, Pitcairn Mailplane, Boeing Model 100, de Havilland Cirrus Moth, S.E. 5A, Spad v11, Nieuport 28 C.1, Fokker D7, de Havilland 4-M2, and Curtiss JN4D. Work is under way to reconstruct additional aircraft.

September—D. J. Dwyer, a Los Angeles contractor, presented a film taken by himself while he was the official photographer for the Canadian Expeditionary Forces in France in 1916. This film included many shots of English airplanes of the period, including the Sopwith Tabloid seaplane, Farman Shorthorn, and B.E. 2's.

November—The meeting was thrown open for discussion of the main topic of interest or central theme

(*Continued on page 8*)

Long Island—Cradle of Aviation

by

Preston R. Bassett*

These excerpts are reproduced with the permission of the author and with the consent of the Lewis Historical Publishing Company, who published the entire sketch, with a few slight changes, as Chapter XLII, Vol. II, of Bailey's "Long Island History" in 1949. "In this brief sketch of the history of aeronautics on Long Island it has been the author's endeavor to select from the many aeronautical activities of the locality those outstanding episodes that have had a direct bearing on the progress of aeronautics as a whole."

Preston R. Bassett.

"A PHASE OF LONG ISLAND'S HISTORY which has been much neglected is the unique part which it has played in the development of aeronautics. The Island, with its beautiful level, grassy plains, became a natural flying field for the earliest birdmen. Then later, as airplanes could venture forth, its geographical position proved to be ideal. To the west of it stretches the whole width of the United States; to the east of it extends the great Atlantic Ocean. Strategically placed near the largest city in America and at the very boundary between the two most important expanses of land and water, it soon became the focal point or zero milestone for most of the great flights which were the stepping stones of progress in building aviation history. All of these factors have made it one of the great aviation centers of the world.

"In tracing the early history however, we must go back to the days when aeronautics meant ballooning. Balloonists generally shunned Long Island, surrounded as it was by water. However, the Island did furnish a safety barrier for the occasional balloonist who found himself drifting from the mainland toward the ocean. These occasional hurried descents of America's pioneer balloonists as they grappled for the last hold on terra firma were Long Island's introduction to the air age.

"The decade of the 1830's marked the inauguration of American aeronautical history. During these years Professor Charles F. Durant, the first great American aeronaut, made a series of ascents in an American-made balloon. Several of these ascents were made from Castle Garden, New York. One of the most interesting of them was made in June, 1833. An unusually large crowd had gathered around Castle Garden at the Battery, attracted not only to watch the ascent but also to see President Andrew Jackson, who was to witness the event. The take-off was made in a fair breeze and the balloon drifted up Manhattan Island and then swung over Brooklyn until it was 'a speck in the sky' to the spectators. The balloon then drifted southeastward over Long Island and headed for Jamaica Bay. Durant therefore had to maneuver for a quick landing, which he accomplished expertly by bringing the balloon down at the Union Course Racetrack in Jamaica. The first great American aeronaut thus introduced aeronautics to Long Island.

"It was not until 1860 that Long Island was again visited, this time by another famous balloonist, Professor John Wise. Wise had made a great many successful excursions throughout the country over a period of twenty-five years and was considered the most experienced aeronaut in America. In April, 1860, Professor Wise made an ascent from Palace Garden, a small private park located at Sixth Avenue and 14th Street in New York City, which he says, in a masterpiece of understatement, 'became more interesting than I anticipated.' A few notes from his story of the flight will give an idea of his first acquaintance with Long Island.

"'After sailing a few minutes in the southeast breeze, I went northward straight over the length of Randall's Island. There I rose higher and struck a breeze from the west and made for Flushing; there I descended with the intention of landing at Whitestone. A strong southeast surface wind was blowing. In coming down the last 1,000 feet, the balloon made three miles in five minutes and I struck the ground near Bininger's cottage mansion on the shore of the Sound. In the concussion the balloon careened so much as to tilt out of the car a sandbag. As soon as the *Ganymede* recovered her perpendicular, she made a bound over the cottage, swinging the grapnel into the eaves of the roof, but the balloon being stronger than the part where the hook took effect, the eaves gave way. The hook next took effect in a big tree between the cottage and the Sound. A squall sent the balloon reeling on the beach with the rim of the wicker basket cut through by the anchor rope. In another moment my car was on the ocean wave. The squalls now and then became so violent as to careen the balloon over until she touched the sea, floundering me into the waters up to my shoulders and putting me through several hydropathic exercises not pleasurable to contemplate. I was half an hour in being dragged over the bay about a mile and a half in breadth. As we approached the opposite shore, a full open valve rendered the *Ganymede* so docile as to enable her to drag me well up on the beach with her water saturated load. Wet and chilled, I reached the land a little below Throgg's Neck on the premises of D. L. Lawrence, Esq., whose kindly comforts I shall ever remember with gratitude.'

"This exciting episode occurred at about the point where the Whitestone Bridge now touches Long Island. John Wise never ballooned over Long Island again.

"It was thirteen years before Long Island again saw a balloon. In the meantime the Civil War had been fought and the country, rapidly recovering from the war, was astir with scientific projects. Among the less practical but more romantic of these projects was the proposal to cross the Atlantic Ocean by air. A young and daring aeronaut, W. H. Donaldson, with the help of Professor John Wise, had persuaded the *New York Daily Graphic* to finance the construction of a great balloon for this bold undertaking. In 1873 the balloon was built and named the *Daily Graphic*. Now for the first time Long Island was going to play a part in making aeronautical history. The Capitoline Grounds, which were located at Halsey Street between Nostrand and Marcy Avenues in Brooklyn, were selected as the place of ascension. Professor Donaldson, in order to become familiar with the local winds and terrain, made a number of short flights from these Brooklyn grounds during September, 1873, in a smaller balloon named the *Magenta*. On one of these flights he floated east over Creedmoor and descended near the Long Island Rail Road depot at Queens. Two days later he made another ascent from the same Brooklyn grounds and after an hour landed again near Queens, where a crowd quickly gathered. As he still had considerable lift left, he invited the ladies to volunteer to make a captive ascent the length of the drag rope. He reports that he 'had his hands full as all the ladies wanted to go.'

"Early in the morning of October 7th there was great activity at the Capitoline Grounds in Brooklyn. The inflation of the great balloon was proceeding rapidly, crowds were gathering, and by 8:30 it was ready. The crew of three climbed aboard the strange craft. They were Professor W. H. Donaldson, aeronaut, Alfred Ford, navigator, and George Lunt, *Daily Graphic* reporter. At 9:19 A.M., the great ship rose amid three rousing cheers. one for each member of the crew. At first it drifted to the north, but at 5,000 feet it struck an eastward current and drifted out over Long Island; at 10:00 A.M. the speck disappeared from the sight of the watchers. It was not until 3 P.M. that afternoon that an accident report came in from New Canaan, Connecticut. The balloon had become lost in thickening storm clouds, had descended over unknown country only to find itself being swept along too fast for a landing, and Donaldson called for all hands to jump when they dipped to within 30 feet of the ground. Donaldson and Ford made the leap onto soft plowed ground, but Lunt hung onto the ropes and was carried away. Fortunately, Lunt hung on until the balloon swept close to a hilltop where he let go and landed safely in a tree top. The balloon was lost. The first transatlantic effort ended within 60 miles of its starting point, but Long Island had been marked for a place in transocean flying history, of which this was only the first faltering step.

"One would expect this experience to cure Professor Donaldson, at least for a time, so it is with some surprise that we find in the records that even before the end of this same month, in fact, on October 29, 1873, Donaldson had taken off again—this time from Newark, New Jersey, on another local ascent. The wind, however, carried him due east over New York Bay and on to Brooklyn. The descent was 'quite exciting and dangerous.' The balloon came down on Long Island, striking the ground with great force. It was drifting southward rapidly. The hooks failed to catch and for half an hour it went lifting and bumping over the ground, knocking down several people and creating great consternation. Donaldson in the wicker basket was dashed against a fence 'breaking four rails in twain.' The balloon crossed the track of the Brooklyn, Central and Jamaica Railroad and came very near being 'dashed to pieces by an on coming train,' but on it went, bouncing and dragging until it crashed against a house, 'bringing to a sudden end its wild career.' Donaldson came through with only cuts and bruises.

"This might be considered a good point to end the story of the hazards of ballooning on Long Island, but that would not be fair either to Donaldson or Long Island. One more flight, all but forgotten, should be recorded. On July 21, 1874, Donaldson made an ascent from the Hippodrome in New York City. It was a fine summer day and the balloon drifted easily over Long Island. He reached an altitude of 6,000 feet, but at 5:40 P.M. brought the balloon down at Pearsall's (now Lynbrook). It being a pleasant quiet evening, he did not deflate the balloon, but reports that 'a lady whose curiosity was greater than her timidity was treated ascension, the balloon being secured by a rope.' At 6:20 P.M. Donaldson re-

Donaldson and Ford leaping from the boat. Lunt clings to the ropes and is carried away. Thirty-sixth ascension.

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* President, Sperry Gyroscope Company Division, The Sperry Corporation.

ascended and drifted on the light sea breeze to the village of Hempstead, where he landed at 7 o'clock. After supper he made a moonlight ascension 'for the benefit of the natives,' making his final landing in a field four miles from the village. And so aeronautics first discovered Hempstead Plains and the 'natives' of Nassau County had there first auspicious glimpse of the air age.

"There is no need of recording the later balloon ascents and descents on the Island. They were not many, but even as late as 1905 an occasional balloon would pass southward over Flatbush and the young boys would all jump on their bicycles and pedal south to see its hurried landing on the broad Dutch farms of Flatlands before the breeze could carry it over the marshes to the ocean.

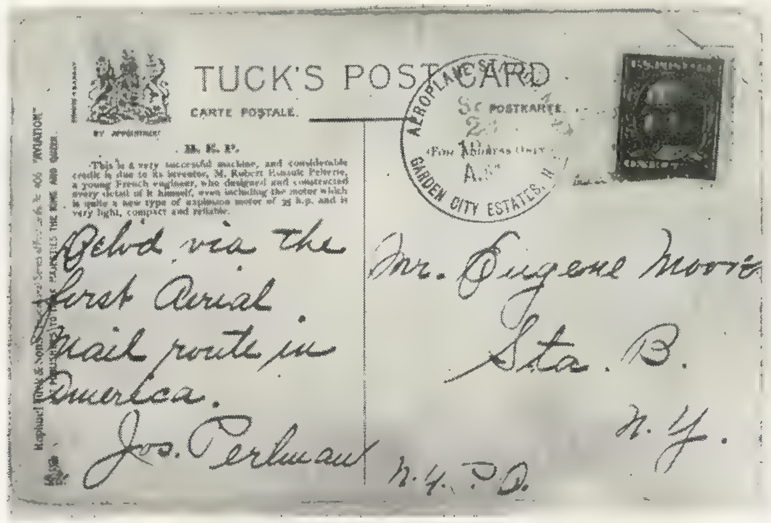
"Certainly, nothing yet pointed to any great aeronautical future for Long Island. The natives were not too impressed by anything they had seen and the aeronauts did not care for Long Island. But by this time other things were happening in the field of aeronautics. The Wright brothers had made their first flights at Kitty Hawk in 1903 and there were occasional rumors that they were still improving their flying machine out at Dayton. Yet they gave no demonstration either to the public or to the press for several years and the significance of their work was, therefore, quite unappreciated.

"By 1907 the public had become skeptical of the practicability or even the possibility of successful flying machines, but not so the scattered band of pioneers and inventors who, fired by the Wrights' achievements, worked harder than ever to solve the problem of flying with heavier-than-air machines. Although most attempts were failures, there were two groups besides the Wrights in 1907 who had achieved success. One was at Hammondsport where, under the leadership of Glenn Curtiss, great progress was being made, and the other was in France, where Santos Dumont, Farman, Voisin, and Bleriot had each made and flown his own machine. The newspapers carried a great deal about the progress which the French were making.

"It was great news, therefore, in July, 1908, when the announcement was made that Henri Farman, the famous French flyer, was bringing his airplane to New York and would make a series of public flights. The Brighton Beach racetrack was chosen as the site and, although only 840 yards long, it was ample for the exhibition flights which were mainly to show the public that the machine could actually leave the ground. The first day, Saturday, August 1st, about 8,000 persons paid the entrance fee only to be disappointed. It was too windy for Farman to risk flying, so the people were given 'wind cheques.' On August 2nd about 1,000 turned up and were rewarded by seeing one short flight down the length of the racetrack. It was the first airplane flight on Long Island.

"During the succeeding week Farman made several short flights on each of the few days when there was no wind, but the public had lost interest. The attendance averaged only a few hundred persons and the exhibition was a financial failure. Nevertheless, it was a great spur to the local boys. It touched a spark and from that day on Long Island was in the aviation business.

"On one of the days of Farman's exhibitions, young Lawrence B. Sperry of Flatbush, not quite sixteen years old, thrilled by this opportunity to see an aeroplane, had taken his motorcycle and arrived at Brighton Beach at 4:00 A.M. to be sure not to miss the flight. Early morning was the best time to fly because of the quiet air. He saw Farman warm up the engine, roll down the field and make a single short hop at an altitude of about 10 feet. That was enough for him. From then on, his life was devoted to aviation. He started building his first airplane that same summer in the cellar of his home. During the next fifteen years he was one of the great contributors to the progress of aviation.



TUCK'S POST CARD

CARTE POSTALE.

This is a very successful machine, and considerable credit is due to its inventor, M. Robert Esnault Pelterie, a young French engineer, who designed and constructed every detail of it himself, even including the motor which is quite a new type of explosion motor of 35 h.p. and is very light, compact and reliable.

AEROPLANE STATION
GARDEN CITY ESTATES, N

Recd via the first Aerial mail route in America.
Jos. Perlman

Mr. Eugene Moore
Sta. B.
N.Y.

N.Y. P.O.

The first official U.S. air-mail cancellation.

"There was now so much interest in the possibilities of flying that a group of enthusiastic young men, all with plans for building their own machines, organized the New York Aeronautic Society and selected the old, deserted Morris Park racetrack in the Bronx as their base of operations. On Election Day, November 3, 1908, this group courageously put on an 'air show,' but their enthusiasm far outran their ability to perform. Twenty thousand witnessed the show, but most of them climbed through holes in the old racetrack fence, so 'the gate' was not so large as expected. There were at least half a dozen flying machines of various queer types on exhibition, but as one report stated, 'none of the apparatuses flew.' A Mr. Lesh went up in a glider towed by an automobile, but a gust of wind caused the glider to crash and Mr. Lesh broke his ankle. It was decided that flying events should be called off and the day was ended with motorcycle races. Aviation was still a most uncertain entertainment.

"During the next year, even though there were about twenty airplanes in various stages of construction, the members at the 'Morris Park Volery' decided to pool enough money to buy at least one airplane that they were sure would fly. A committee visited Glenn Curtiss, who had built several successful machines. Curtiss was so surprised and pleased at the appearance of a customer for an airplane that he said he would design and build a new plane for them. Thus was closed the sale of the first commercial airplane in America.

"In June, 1909, the new plane was delivered at Morris Park and Glenn Curtiss came down to demonstrate it. He made several short flights around the racetrack. Its performance was excellent. The machine was accepted and christened the *Gold Bug*, but the Bronx was no place for aviation, so Glenn Curtiss suggested that they look over on Long Island for a place where they could demonstrate its performance. He was anxious to make an attempt to win the Scientific American trophy which had recently been offered for the first flight of 25 kilometers ($15^1/_2$ miles). Curtiss and several others drove out on Long Island and were greatly pleased to find the large level stretches of Hempstead Plains. They chose a field east of Mineola as a 'nice flat place.' There, in the early morning hours of July 7, 1909, Curtiss made the flight. To witness this through the eyes of an old Long Islander, the following story is quoted from the reminiscences of the late Valentine W. Smith, of Far Rockaway.

"'I recollect an early morning in the summer of 1909, before any wind would be likely to rise, Mrs. Smith and I drove to Mineola to see Glenn Curtiss attempt to fly an airplane. This airplane looked like an enlarged box kite. The driver's seat projected out in front and the engine with the propeller, set to push forward, was at the back. It was an ideal morning with no wind stirring, and at sunrise Mr. Curtiss wheeled the machine to the east side of the Fair Grounds, and went up a little higher than the tree tops and circled around for half an hour. At the end of that time the plane fairly collapsed from the excessive strain, but he had remained in the air just long enough to win the prize of $10,000.'

"That early morning flight was truly a milestone in Long Island aviation. The airplane had finally discovered its natural home, Hempstead Plains, a friendly ground over which it could strengthen its pinions. The hum of the airplane has swelled over the Plains from that morning to the present time.

"In the next few weeks on this same Mineola field, Curtiss, before returning to Hammondsport taught Charles F. Willard, of the Aeronautic Society, to fly. On August 13th, Willard made the first extensive cross-country flight over the Plains—Mineola, Garden City, Westbury, Hicksville—and then a forced landing. It proved the advantage of the Plains, since forced landings were a most common occurrence in these early days and here they were comparatively safe.

"On many a pleasant afternoon in those early days, Washington Avenue, which was the western boundary of this field, would be lined with motor cars laden with the admiring public. When one of the flyers would bob his plane up and down like a gentle roller coaster, they would all honk their horns in enthusiastic applause.

"1909 was the year of the Hudson-Fulton celebration. On September 29th, Wilbur Wright gave his first public flying demonstration to New York City. Taking off from Governor's Island, he flew around the Statue of Liberty and back flying over the Hudson River. This was the climax of the celebration and the first airplane flight the cities of New York and Brooklyn had ever witnessed.

"By 1910 most of the flying activity around New York had settled at the Mineola field. Flying schools were starting up. Many inventors were still working to build their first airplanes. Dr. Henry Walden flew the first American-made monoplane. Clifford B. Harmon, sportsman and aeronautical enthusiast, made a flight from Mineola, over Port Washington, across the Sound, and landed at Greenwich, Connecticut. For this great achievement, Harmon was presented the *Country Life in America Trophy*.

"In August, 1910, Glenn Curtiss, McCurdy, Willard, and Bud Mars held a series of flying exhibitions at the old Sheepshead Bay racetrack. Major Rieber, a balloonist of the Signal Corps stationed at Governors Island, was an interested spectator the first day. He discussed with Glenn Curtiss the idea of adding a military feature to the program by having an officer fire a service rifle from an airplane in flight. Curtiss at first was afraid this would be dangerous; the rifleman would have to sit on the edge of the wing and would not be able to hold on to both the airplane and the rifle at the same time. Also, it was feared that the recoil of the rifle might upset the plane. In those days there was little knowledge of airplane stability. But Curtiss finally consented to the experiment and Lt. J. E. Fickel of the Infantry was given the assignment. A white target was spread on the ground and Curtiss, with Fickel as passenger, flew over it at an altitude of about 100 ft. Fickel fired as they passed over the target. Two bullet holes were found in the target, according to Lt. Fickel's official report. As far as is known, this is the first rifle firing from an airplane in flight. Lt. Fickel later transferred to the Aviation Section and rose to the rank of Major General in the Air Corps.

"There was one other important 'first' which can be credited to this obscure air show at Sheepshead Bay. On August 27th, J. A. McCurdy, one of the original group of Curtiss flyers, took aloft in his plane a cumbersome spark wireless transmitter and sent the following message to the ground:

> "Horton—Another chapter in aerial achievement is recorded in the sending of this wireless message from an airplane in flight.
>
> McCurdy

"The biggest event of the year 1910, however, was the great International Aerial Tournament held at Belmont Park, Long Island, October 22nd to 31st. This was the first international air meet held in America, with representatives from England, France, and the United States competing for the many prizes. The sensational Statue of Liberty race for the Thomas Fortune Ryan $10,000 prize was won by Count de Lesseps of France. Claude Graham-White of England beat him home, but was disqualified for fouling a pylon. Graham-White, however, had won the Gordon Bennett $5,000 speed contest in which the Frenchman, Le Blanc, had surpassed all speed records, 68 miles per hour, only to be disqualified by crashing at the finish.

"It was during the Belmont Park Meet that Ralph Johnston and Arch Hoxsey, two of the most skillful and daring American birdmen, became known as the 'Star Dust Twins.' Both were striving to win the $5,000 altitude prize. Every day they rose a little higher, each seeking to outfly the other. Late one calm afternoon, they both took off for another attempt. For one hour they spiralled upward. The sun went down, but neither would be the first to give up. The contest ended only as the fuel tanks ran dry. First one and then the other sputtered into silence as the anxious crowd waited in the dim twilight. Both machines landed safely in a Long Island potato patch. Johnston won the altitude contest with a world's record—9,714 feet.

"This meet was a great success with plenty of thrills for the spectators, as luck, skill, and daring all played equally important parts in the flying of the day. Furthermore, aviation was at last receiving recognition. The spectators at the Belmont Meet included Lieutenant Governor Timothy L. Woodruff, Thomas Fortune Ryan, Clarence Mackay, and many others who represented society and capital.

"By the year 1911, the birdmen were truly venturing out. Cross-country flight held the lure. Many flight records from this place to that were being made, but perhaps the outstanding flight of the year was that of Calbraith P. Rodgers, who started for California from Mineola Field on September 17, 1911. The remarkable thing was that he finally got there, even if it did take 49 days, many of which were needed to patch up and rebuild the airplane after forced landings. In fact, Rodgers had to spend some days in a hospital for repairs on himself after one of the crack-ups. On December 10th he arrived at Long Beach, California, completing the first transcontinental trip ever made by air. From that day on, the transcontinental record has been whittled down a little at a time until, as this is written, the jet-propelled P-80 has brought it to 4 hours and 15 minutes from California to Mitchel Field, Long Island, within sight of the same place from which Rodgers took off thirty-five years earlier.

"In the Fall of 1911, the Second International Air Meet was held on Long Island. This time the site chosen was the new Nassau Boulevard air field on the edge of Garden City, just north of the Long Island Railroad tracks at the Nassau Boulevard station. The following paragraph from *Town and Country* magazine (1911) indicates how the flyers had come to consider Long Island.

> "The birdmen flock to Long Island as instinctively as partridges to a thorn grove. The mile-wide

(*Continued on page 8*)

Jean-Pierre Blanchard's Early Exploits in Aeronautics

By

SIDNEY I. POMERANTZ

Professor Pomerantz, a member of the Department of History, The City College, New York, is doing a biography of Jean-Pierre Blanchard. He is the author of "New York: An American City, 1783–1803."

DECEMBER 9, 1792, was a memorable day for Jean-Pierre Blanchard and no less so for America, marking, as it did, the arrival in Philadelphia of this celebrated aeronaut fresh from his European triumphs. Fleeing from the turbulence of the Old World, he looked forward to a career in the New. Nor did he lose time in announcing his mission and launching his "grand experiment," the culmination of which, on January 9, 1793, was the first aerial flight in America and the forty-fifth ascension for Blanchard. Dramatic as are the details of the career of this remarkable Frenchman in the United States and forming as they do an important chapter in the history of aeronautics, they take on added significance when understood in the light of his previous spectacular achievements.

The growth of American culture in the eighteenth century can, perhaps, best be appreciated when assessed in terms of the transit of civilization from abroad. Certainly, this is true in the case of the new science and art of aerostation, as ballooning was then termed. In the Atlantic community of that age, men's imaginations were stirred as never before by the challenge of scientific discovery, and the perfection of the techniques for the rapid communication of ideas aided immeasurably in this respect. Broadsides, pamphlets, magazines, newspapers streamed from the presses to whet intellectual curiosity and educate the public to accept the wonders of a modern era of free inquiry.

Few in his field were as adept as Blanchard in manipulating the media of popularization, the purposeful use of which helped to make possible his own exploits. "The progress of the arts," he once explained, "depends on the . . . notoriety of the means employed in bringing them to perfection." In coming to America, therefore, Blanchard brought over not only a decade of European experience in aeronautics but the expert skill of a professional exhibitor pioneering in a new science. The full measure of this important contribution to the cultural life of the young republic may be estimated by an analysis of his early methods and the phenomenal popular and scholarly response they engendered.

Photo courtesy of the New York Public Library

Engraving of Jean-Pierre Blanchard from *The European Magazine* of London, June, 1785.

43 70

From the very inception of his interest in flight, this native of Normandy, already widely known there for his mechanical ingenuity, managed to gain serious public attention in Paris for his *vaisseau volant,* a heavier-than-air flying ship built along the lines of an ornithopter. He was twenty-eight that summer of 1781 when the *Journal de Paris* opened its columns to him. But nothing came of this invention except much adverse comment. Down but not out, Blanchard's ambition to go up into the air was given a new boost by the electrifying news of man's first aerial voyage on November 21, 1783. This achievement with a Montgolfier balloon was followed soon after by a dramatic ascent in a hydrogen or "inflammable-air" balloon. What Pilâtre de Rozier and the Marquis d'Arlandes, the Robert brothers and Professor Charles could do, thought Blanchard, he could do better. Accordingly, he set about constructing a hydrogen-inflated aerostat, not neglecting to introduce some of the features of his old *vaisseau volant.*

While hard at work on his balloon, Blanchard took pains to keep his name before the people, finding in the columns of the *Journal de Paris* a convenient vehicle for this purpose. Original plans called for an ascension from Paris on February 27, 1784, but this was held over to March 2 when he finally rose from the Champ de Mars for a momentous flight that took him well over 9,000 ft. in the air. After an hour and a quarter, he brought his aerostat safely to earth at a village some distance away. Advertised as a demonstration of the use of the elaborate steering mechanism of *vaisseau volant* inspiration, the ascension was made without most of this equipment, because all but a rudder had been damaged in an altercation preceding the event which was brought on by a cadet who sought to accompany the aeronaut. Though Blanchard manipulated the rudder for all it was worth, he failed, much to his chagrin, to direct the course of his flight. In fact, he landed in a direction opposite to that publicized as his destination. Whatever the mishaps, the feat was duly heralded in the press, to which the hero of the day contributed his own official version. It had been witnessed by "an incredible number" of spectators, observed a London paper, and it was on that sort of encouragement that Blanchard thrived.

He was now ready for new records to attain and new worlds to conquer. Rouen, his youthful stamping ground, became the scene of his second and third aerial voyages. On May 23 and again

on July 18, Blanchard made spectacular flights; on the latter occasion he was accompanied by a Monsieur Boby, registrar of the *parlement* of the city. On these ascents, steering apparatus of four wings or oars and a rudder were taken aloft. During the second voyage, the wings were moved "a great deal" but the wind proved "too contrary" for satisfactory navigational results. However, the third ascension, thought Blanchard, demonstrated the efficacy of this equipment; but subsequent flights failed to confirm his original enthusiasm for its usefulness.

Much was made of these aerial achievements. "All the papers," remarked London's *Gentleman's Magazine,* ran verbatim accounts of Blanchard's "exact and authentic narrative" of the third voyage. It was printed in pamphlet form, translated into English, and "impartially and critically" reviewed. This third triumph had lasted for $2^{1}/_{4}$ hours and had carried the balloon a distance of 45 miles. The aeronauts had taken up with them compass, barometer, and thermometer. Their basket was also equipped with a large parachute, or umbrella, "hung over them to break the force of descent if the balloon should burst." But no untoward incidents occurred; it was a thrilling voyage, so much so, that the intrepid participants seriously considered, when near the sea, crossing the Channel to England. They enjoyed it all and, as opportunity arose, saluted the spectators below with flags taken along for the purpose.

Early in August, 1784, Blanchard was hailed by a French correspondent of the press as ranking with Pilâtre de Rozier, the Robert brothers, and Prof. J. A. C. Charles in the practice of "the sublime discovery" of the Montgolfiers. But Blanchard's ambition was to accomplish a feat that would lift him far above even these celebrated pioneers in aerostation. Accordingly, on August 16, he was on English soil, seeking a chance to try a cross-Channel flight and assuring himself as well that the press back in France was fully informed as to his plans. For a time, however, lesser record-making challenges attracted him.

Blanchard has left a memorable journal of his first and second aerial "excursions" in England—the fourth and fifth, respectively, in his career. After weeks of publicity about the "Grand Aerostatic Experiment," he ascended at long last from the grounds of the Military Academy at Chelsea, not far from London, a little after noon on October 16, 1784. With him went Dr. John Sheldon, professor of anatomy at the Royal Academy and a fellow of the Royal Society. Cheering them on, were most of the inhabitants of London and environs, excited, as the *London Chronicle* reported, by promises of deeds heroic and demonstrations of navigational prowess which only a Blanchard dared make. "The attention of a thinking and speculative nation will ever be attracted by grand and important philosophical experiments," explained the *Chronicle.*

Though most of the instruments taken along by Dr. Sheldon had been dropped to lighten the load, though the barometer had broken down, and though the steering gear refused to work, the flight was "beautiful to excess." Blanchard had even dreamed of a glorious passage over the city of London and the Channel, but he had no cause to complain about the actual voyage, which lasted 41 min. and took them to a meadow about 14 miles from London. Here, the balloonists alighted to take on new ballast, and, by artifice or otherwise, Blanchard, leaving Sheldon behind, soared once more aloft.

For a little over 3 hours the balloon sailed above, giving its occupant ample opportunity to display his bag of tricks. He greeted the spectators below through a speaking trumpet and saluted them with much waving of the English and French flags. He released two courier pigeons; one, carrying a letter to a friend, arrived safely in London. He drank wine and played merry tunes on his flageolet, and, never forgetful of his claim to status as a man of science, he dropped cards that noted barometer and thermometer readings. He also kept account of his own reactions to changing atmospheric conditions. By 4:30 that afternoon he made his descent some 78 miles from London, returning to the metropolis very much the hero. "He is not only the intrepid philosopher, but the man of real science," commented the *European Magazine* ecstatically.

Sought out by the wealthy London surgeon and scientist, Dr. John Jeffries, Blanchard found in him an exceedingly generous patron and an enthusiastic and able collaborator. On November 30 of the same eventful year, these two made an aerial flight over London that continued for 1 hour and 20 min. In a lively paper presented to, and later read before, the Royal Society, Dr. Jeffries reported on this achievement. On the advice of Cavendish, the aeronauts had made many useful meteorological observations. Furthermore, much practical experience was gained in the art of aerostation. As for Blanchard, his reputation was now higher than ever. Comparing him with Vincent Lunardi, "the first to visit our variable atmosphere," the *London Chronicle* concluded that "Mr. Blanchard is by far the most expert and accomplished aerial traveller." Not only in the press of two nations but in pamphlets thrown to the spectators during the course of the flight, Blanchard gained wide coverage for his activities past and present. In response to "the present rage for balloons," the editor of the *Journal des Savans* prepared a catalog of "acrostatic voyages," an account of which was reprinted in the English periodicals and which gave due tribute to Blanchard's place among the aeronautical pioneers.

Shortly after their initial flight, Dr. Jeffries joined the Frenchman in a more ambitious undertaking—an attempt to make the first aerial crossing of the English Channel from the cliffs of Dover, near the royal castle, to the French coast. Relying on the same aerostat that he had used since his Paris ascent, Blanchard, with the financial support of Jeffries (who had been subsidizing him right along after their London venture) had all in readiness by December 17. The balloon, 27 ft. in diameter, was in perfect order; its aerial car or boat was fitted with a pair of wings or oars and a rudder, as well as a moulinet or sort of propeller. On board went three 10-lb. sacks of sand ballast, a large package of pamphlets, two cork jackets, some clothes, several inflated bladders, and a couple of small anchors. To these were added just two "philosophical instruments," a barometer and a mariner's compass. Inclement weather kept the two aeronauts grounded until the morning of January 7, when, "the sky being clear" and the wind in the right direction, the car was attached to the bag by the use of strong netting, a hoop, and cords. It was a little after 1:00 p m. when the aerostat finally rose from the cliff "to the rapturous astonishment of thousands of spectators."

The hazards of the passage called for all the courage and skill the two could muster. Midway across, the balloon began to fall rapidly, necessitating heroic measures. Everything from Blanchard's precious pamphlets to the clothes they wore went overboard to halt the precipitous descent. "Cramped and stiffened" from the cold, having only the cork jackets for safety, they awaited the worst and expecting it, too, since hydrogen was seeping from the balloon. But Providence had a different fate in store for them. The balloon began once more to rise, the French shore was reached, and the crossing had been accomplished! They had been 2 hours going over Dover Strait and spent 47 min. over France, landing in the forest of Guines near Ardres.

What followed must have warmed the heart of even a man so jealous of honor as Blanchard. He was returning to his native land in a blaze of glory, and the next few weeks were filled to overflowing with the sweet nectar of national adulation. Dr. Jeffries took careful note of it all in his diary, extracts from it being published in 1885 by his grandson, Dr. B. Joy Jeffries. Back in England, Dr. Jeffries prepared his own *Narrative of the Two Aerial Voyages*, publishing it in 1786. The journals of the day also carried the story, embellished with illustrations, and indulged in sage editorial speculation on the significance of "this adventure." "Philosophy may hereafter improve this science, and accommodate balloons to some useful purpose," observed the *Gentleman's Magazine*, "but all future ages must applaud the abilities and admire the cool, intrepid, determined conduct of these two men."

As for Blanchard, France did nobly by him, awarding him a royal gift and annual pension. When the shouting was finally over, he returned to England, fortified in his determination to exploit a well-deserved reputation. In the spring of 1785, he made four ascensions for the edification of the London populace. On May 3, he took up with him Mlle. Simonet, the 14$^{1}/_{2}$-year-old daughter of a friend, thereby establishing the young lady's fame as the first of her sex to ascend in England. "Mr. Blanchard yesterday," declared the *London Chronicle*, "acquitted himself of his engagement to the Public highly to the increase of his character," and this in sharp contrast to the signal failure of a rival aeronaut, Count Zambeccari. Four days later, Blanchard demonstrated once more "in his new balloon and apparatus." On May 21, a junior Mlle. Simonet, sister of the older girl, also ascended with him and remained aloft for nearly 2 hours, descending and returning to the place of departure to the accompaniment of a band of music and the plaudits of a large and distinguished gathering.

That spring he also began a series of pioneer parachute experiments in the Stockwell Road near Vauxhall, London. In this connection, on June 3, Blanchard, in the course of an ascent, released a cat tied to "a large silken umbrella" or parachute, and the animal reached the ground unharmed. Other experiments, some not so happily concluded, followed, but the public, once the novelty of these exhibitions had worn off and with its customary impatience at anything but perfection in matters mechanical, lost interest. By July, Blanchard had returned to the continent, where more profitable record-making—and -breaking—opportunities awaited him and where, also, his English experiences that spring had been given a good press, as a collection of his letters from London, appearing in *L'Esprit des Journaux* (the *Reader's Digest* of its day) indicated.

Within 4 months, he enhanced his reputation by a spectacular series of aeronautical "firsts." His was the first aerial voyage in Holland, made on July 11, culminating in an unpleasant dispute with the peasant into whose field the balloon had descended. Ascents from Rotterdam and Lille followed, the latter turning out to be a 300-mile trip. October found him in Frankfort-on-Main, where, on the 3rd, he made the first ascent in Germany. On November 20, ascending from the citadel at Ghent, he won acclaim as the first to make an aerial voyage in Belgium, displaying unbelievable courage in a hazardous landing. And so it went.

The next year he added six ascensions to his record, and, as the *New London Magazine* put it, his renown "increased by every adventure." The year 1787 proved even more eventful. Seven new ascensions raised his total to 29 and took him to Valenciennes, Nancy, Strasbourg, Leipzig, and Nuremberg. In 1788, Blanchard displayed his skill at Basle and Metz, at Brunswick and Berlin, making certain to fill the columns of the press with accounts of his doings, daring enough in themselves and now made more so by a reckless confidence that he would "yet have the satisfaction of returning to Paris on a fixed day, flying in the air!" The succeeding years were filled with the excitement of mounting popularity. Warsaw, Breslau, Prague, Vienna, and Hanover acclaimed his aeronautical talents. With 43 ascensions to his credit by 1792, he made a 44th that year at Lübeck. It was his last before going to America.

Caught up in the vortex of the French Revolution, he was charged with spreading revolutionary ideas and was imprisoned by the Austrian authorities. Released, however, he decided to seek opportunity abroad, seeing in the United States a promising field for his aeronautical endeavors and eager also to visit "ye People of America, ye wise and happy Nation, knowing the full value of liberty."

43 70

Long Island

(*Continued from page 5*)

> plain running down the center of the Island is a natural homing ground for the flyers. It is now time for the pick of the aviators of the United States and Europe to make their second annual migration to this attractive piece of country.

"At this meet there were again many prizes and many entries. The site was colorful, as there was a row of over twenty small hangars, each housing one contestant and his airplane. His country's flag flew over the hangar. Various races and contests were held each morning and afternoon for a week, but the outstanding event that made aviation history was a small side show which the Aero Club arranged with the Post Office Department. Earl Ovington, one of the popular local flyers, was sworn in as air-mail pilot No. 1 by Postmaster General Frank H. Hitchcock. A temporary mail station was set up at the field. On the first day of the air show, the Postmaster General himself handed the first air-mail bag to Ovington in his Bleriot monoplane. He placed it between his knees and took off for Mineola, about six miles away, where he dropped it near the Mineola Post Office. In several flights he carried 640 letters and 1,280 postcards. These pieces of mail, each with a special official cancellation, are now much sought for and prized by stamp collectors—the first official air mail in America.

Annual Report

(*Continued from page 1*)

along which each member could align his particular hobby. It was decided to place a display in the I.A.S. building, to be changed regularly and to be voluntarily sponsored by a member or group of members. The display is a historical event of their own choosing (subject to the approval of the Executive Committee). This display should be in existence by the February meeting. (The 3rd Friday of the month is the scheduled meeting time.)

January—There were 27 members and several guests at this meeting. After an hour's discussion of business, Joseph Barry presented his paper on the Lougheed Brothers, a résumé of many articles written by him on Lockheed's history and published in the *Lockheed Star*. Frank Courtney was a special guest and was asked to give a brief description of his test-piloting of the first successful autogiro, the Cierva. Ed Marshall, another guest, has enjoyed acquaintanceship with many of the "greats" of aviation—Curtiss, Lindbergh, Hoxsey, Goebel, Tinn, etc.—and has some fascinating stories to tell of the flying days around Los Angeles. He maintained a flying school at Mines Field, now Los Angeles International Airport, in the days before the National Air Race of 1928. He will be guest speaker at a future meeting.

Each meeting there is a book auction, at which the members place their extra copies or unused aviation books. A minimum price is set, and all above that figure goes into the treasury. In three meetings this has netted about $25. Books sold have included *Jane's 1942*, *Technical Notes—Royal Flying Corps*, *Gas Turbine Development*, some German books, and some rare magazines.

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Patent Model of Ornithopter Recovered

WHILE DOING RESEARCH for a book on early American attempts to fly, Don Dwiggins, Aviation Editor of the *Los Angeles Daily News*, recently recovered the second of two models of an ornithopter that was patented in 1889.

The patent was granted to Reuben K. Spalding of Rosita, Colo. In the late 1800's, the patent department was not issuing patents on heavier-than-air machines for the same reason that they were not granting patents on perpetual motion machines—no one was able to prove that they would work. Spalding got around this requirement by attaching a balloon to his ornithopter, which made the device capable of flight insofar as the Patent Office was concerned.

The information on Spalding's invention, Patent No. 398984, came from Clarence Spalding, grandson of Reuben Spalding. His first attempts to fly resulted in a broken leg when he jumped off a barn. Some time later, when his leg had mended, he repaired the damaged ornithopter and decided that his main trouble was the lack of altitude.

Spalding ordered a balloon and set the day for the big flight. A great amount of enthusiasm was created, and the whole town turned out to watch the demonstration. As luck would have it, the balloon failed to arrive. Spalding decided to try it anyway and strapped the contraption to his back. After several unsuccessful attempts to take off, the local cowboys, who by then had become fired up on whiskey, decided that he was a fake. In the fight that followed, someone pulled a knife. One of the leather straps used to hold the wings to Spalding's body acted as a shield, and the blow that was aimed at his chest struck the strap instead. Not long after that, Spalding gave up the idea of trying to fly.

(*Continued on page 4*)

Don Dwiggins

Members of the Los Angeles Historical Associates Branch of the I.A.S. are shown judging the scale-model flying contest conducted by the Inglewood Flightmasters Model Airplane Club. Seventy points were allocated to the accuracy of the model and 30 points to its flying ability. The contest was won by Louis Culler, who entered a 3-ft. model of a Cub Pacer. Culler received 60 points for accuracy and 30 points for a flight of 2 min. and 25 sec.

The judges *(left to right)* were R. B. Johnston, The RAND Corporation; E. W. Robischon, Western Region Manager of the I.A.S.; Gale Bartlett, Lockheed Aircraft Corporation; and George Lawlor, North American Aviation, Inc.

Photo by Lee Enich, H.A.I.A.S.

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Magazine Aeronautica

The History of Aviation As Shown in Magazines

EDWARD L. STERNE

THIS IS A STORY about magazine aeronautica—not aeronautical magazines.

For more than 150 years, magazines of all kinds have been reporting aviation in all its phases. Fact, fiction, fantasy, and forecasts have held sway among a multitude of illustrations. Therefore, I do not believe any collector can shut out magazine material entirely. Nor do I think any collector has room for complete runs of magazines or even for as many single bound copies as might be desirable. So what can be done?

Scarce magazines should be preserved in their entirety while extracts can be made of aviation material in more readily obtainable periodicals. The extracts should include covers, title page, index, and a back sheet. They can be neatly stapled into a colored paper wrapper, labeled, and filed in a small space.

It will be impossible in this article to give more than a few samples showing the importance of magazine material to the collector of aeronautica. As many phases as possible will be included.

The first air meeting at Los Angeles was covered by at least three western magazines, all now difficult to find. *Western Field* for March, 1910, has a well-illustrated story and a full page cover showing Paulham at Tanforan. The January, 1910, *Out West* had not only a good article on the Los Angeles meeting but also one on the Lowe airship. *Sunset* for March, 1910, has a colored aviation cover, a story about the flyers at Los Angeles, another about western airmen, and a third, by Lt. Paul W. Beck, on "Flying Men O' War."

Still dealing with 1910, we find in the October *Technical World* an article by Arthur B. Reeve about gyroscopes in planes, which says Stanley Y. Beach had perfected a gyroscope that would be the brains of future planes.

Another modern development was discussed in 1910. In the May issue of *Pacific Aerogram*—not an aviation magazine but a "newspaper" for ocean liners—is an article telling how an aviation meeting at Seattle was reported to the newspapers by wireless. This issue, in perfect magazine format, also has other wireless-plane tie-ups and styles itself as an "aviation number."

While on the subject of "aviation numbers," mention must be made of *Country Life in America* for July 15, 1911. This periodical used Clifford B. Harmon and Philip Wakeman Wilcox as consulting editors for the issue.

How different from a few years before when *Collier's* for January 23, 1904, gave the Wright Brothers' first flight a scanty mention. I believe it was the first periodical to mention that flight.

One can excuse the periodicals for their caution, because, all through the 1800's, magazines had been writing and illustrating stories about flying machines that never flew. One *Scribner* issue in 1879, for example, had pictures of aerobats, aeronons, and other strange devices.

43 70

But, of course, one cannot laugh at the French periodical *L'Illustration*, which, in April, 1843, had a most thorough story on the Henson machine. Not only does it have a picture of the Henson plane over Dover but also two diagrams showing struts, stays, and working parts.

Going back still further, there is the *European Magazine and London Review* with exciting and factual balloon material. The paper of these magazines is excellently preserved, and many of the engravings are of good value to the collector.

In addition to all direct news of the early balloon flights, one finds such items, in the November, 1784, issue, as announcement of a new farce at Covent Garden called "Aerostation or the Templar's Stratagem" in which the "passion of a lady of fortune for balloons furnishes the occasion of a stratagem."

Returning to the nineteenth century, we find that *The Illustrated News* of June 7, 1851, has a picture of the first balloon made in Ireland. *Harper's Weekly* for July 13, 1878, has a full page showing Professor Ritchell in flight in a dirigible over the Connecticut River at Hartford.

That dirigible is a little more crude than the one depicted on a full-page color cover of a *Scientific American* supplement in 1905, showing Roy Knabenshue over the East River and lower Manhattan.

Good pictures of the Zeppelin's "first flight" are in *McClure's Magazine* for November, 1900, and the *Metropolitan* for October, 1908, has a well-illustrated Farman article.

Langley, Maxim, and other experts wrote for various magazines, and Graham Bell's article on tetrahedral kites is only one of several aviation items in early *Geographics*.

Narratives by pioneers and of pioneer flights are in many magazines of general circulation, as would be expected. But who would look for early air material in the French *La Nature* and the Italian *Touring?* There is plenty of it.

It is in the field of "sidelights" that some of the most interesting material is found.

Atlantic Monthly for October, 1910, has a Havelock Ellis article on "Aviation in Dreams." *Discovery*, a London publication, dealt with Sanskrit pre-flight poetry in 1922. On the antiflying side, one cannot forget The Reverend J. Dawson's "Invasion of the Sky" in the *Hibbert Journal* for July, 1911.

American Forestry ran important stories on the spruce industry and aviation in the late days of World War I and in postwar issues, and various magazines discussed the topic of fighting forest fires with the aid of planes.

Still in the realm of sidelights, mention must be made of "Darius Green and Flying Machine," which first appeared in *Our Young Folks* for March, 1867. Kipling's "With the Night Mail" was also a magazine "first." It saw daylight in *McClure's Magazine* for November, 1905.

There are also advertisements to consider, such as that for "Marriott's Aeroplane Company for Navigating the Air," often published in the *San Francisco News Letter* in the 1880's.

So it goes. I have hundreds of magazine extracts and clues to many more. A thick bibliography in small type would be needed to cover the field. Such a work would start collectors on many a long hunt, and these hunts can be difficult. I was started on one of these hunts by a critic's mention of a poem written by Macklew. It apparently was just published when the *London Review* said in April, 1784—

"The only stanza in this poem ('The Air Balloon or Flying Mortal') that is desirable, is the last, where the author, anticipating the improvements and effects of the air balloon, exclaims with poetic fancy if with little judgement:

> "How few the worldly evils now I dread
> No more confin'd this narrow earth to tread,
> Should fire or water spread destruction drear
> Or earthquake shake this sublunary sphere,
> In air balloon to distant realm I'd fly
> And leave the creeping world to sink and die."

Long Island—Cradle of Aviation*

by

Preston R. Bassett†

"ONE OF THE GREATEST PROBLEMS in connection with the early airplanes was the question of stability. The wide variation in the designs of the early airplanes was due to the quest for more stability, but without much success. The pilot could never relax in flying or his ship would go out of control. This problem became so serious that the French Government in 1913 offered a prize of 50,000 francs for a stable airplane. Over eighty competitors from all parts of the world entered the competition. Among these entries was one from Long Island. Lawrence Sperry, now 22 years, had been working with his father, Elmer A. Sperry, on the idea of applying an automatic stabilizer to an airplane instead of redesigning the airplane itself. Elmer A. Sperry had just recently founded the Sperry Gyroscope Company in Brooklyn and was interested in helping his air-minded son by trying to stabilize the airplane with gyroscopes. Together they worked out a design and installed it on a Curtiss flying boat. Lawrence did the test flying and by the Spring of 1914 he was ready for the competition to be held in Paris.

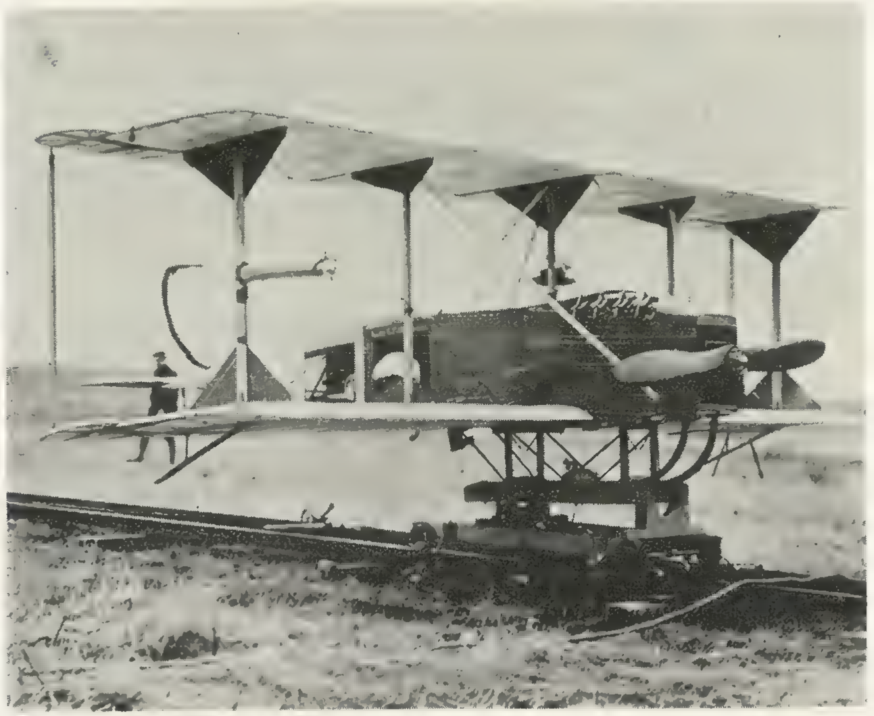
"Lawrence made the trip to France alone, taking with him his plane and gyro-stabilizer. He assembled it on the bank of the Seine with the aid of a French mechanic and started the drastic tests. Most of the competitors with various freak designs were quickly eliminated; the contest came down to a few. Lawrence arranged a special demonstration flight. Taking his mechanic with him as passenger, he had him climb out on one wing while in flight and as they flew low past the judges' stand, Lawrence stood up and raised both hands above his head. This was indeed convincing; nothing like it had ever been seen before. The airplane could really fly by itself. Sperry brought the prize back to Long Island.

"Within a month war started in Europe. Safe and level flying with automatic stabilizers was temporarily postponed. The airmen were soon flying dangerously in dog fights that included all kinds of maneuvers. But the automatic stabilizer did not die. Instead, it went into the secret category and became one of the great secret projects of World War I.

"When the United States entered the war, both the Army and Navy were interested in the possibility of using the gyro-stabilizer to control the pilotless plane loaded with explosives and guided by radio. In those days it was called the "aerial torpedo." Now it would be classified as a "guided missile." Glenn Curtiss designed a very small, simple plane which could be launched by catapult and had no landing wheels. Sperry installed the stabilizer and control devices. A secret test field was selected on the edge of the Great South Bay near Amityville, and there, during 1918, many successful flights were made with the first guided missile the world had ever known. As it was, of course, too expensive to lose an airplane every time it was tested, Sperry would ride out as a passenger on the missile until it had reached the target over the ocean; he would then take over the controls and fly it back. Sperry even flew the final torpedo design which was not built for a human pilot. This he had to land on skids on the ice of Great South Bay. The war ended, however, before any of these weapons were actually used and the project slumbered in the secret files until reawakened by World War II."

An idea ahead of its time was the public demonstration of automatic flight in Paris in 1914. That year Lawrence Sperry, son of the founder of the Sperry Gyroscope Company, won first prize in "stable airplane" competition (see above) while the automatic pilot flew the craft above the Seine.

The Sperry-Curtiss Aerial Torpedo, the world's first guided missile, is shown on its launching rails at Amityville in 1918.



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† President, Sperry Gyroscope Company Division, The Sperry Corporation.

One of the Most Important Documents in the History of Aviation

by

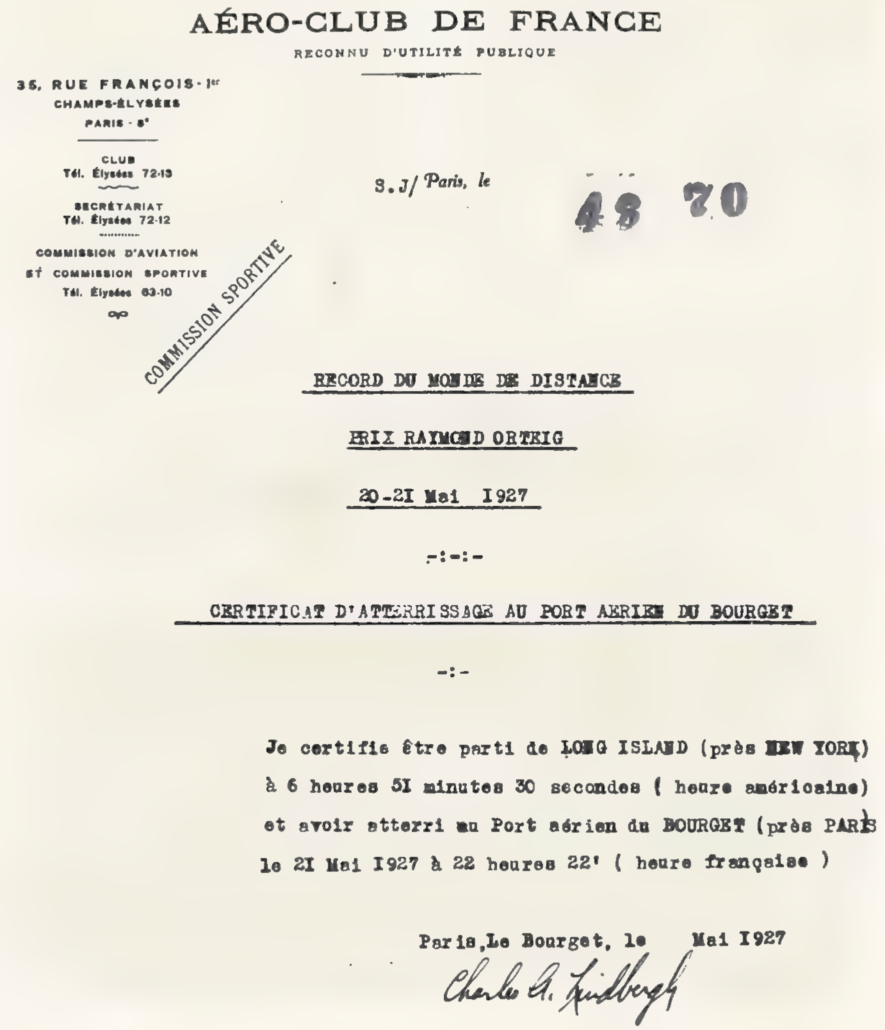
Otto Kallir, Ph.D.

When Charles A. Lindbergh crossed the Atlantic on his historic flight on May 20–21, 1927, he won the Raymond Orteig Prize, which had been established for the first person who had crossed the Atlantic in a nonstop flight from New York to Paris. After landing at the airport of Le Bourget, Lindbergh was taken to Paris by Colonel Weiss and brought to the American Embassy, without having any contact with the officials of the airport or the Aero-Club de France.

Only the next day Lindbergh went to the Aero-Club to have the data of his flight established. His barograph had been taken from his plane to the Aero-Club, and Lindbergh signed the document, confirming his crossing. The document was written on the letterhead of the Aero-Club de France and made out in two copies, one of which remained in the archives of the Aero-Club; the second was kept by the well-known chief engineer and secretary of the Sport Commission of the Club, Louis Hirschauer. After his death, his widow handed the document over to Charles Dollfus, the well-known French collector and director of the Musée de l'Air in Paris.

When I saw the document in Mr. Dollfus' collection in 1949, I explained to him that this American document should be in the United States, and we exchanged it for an object in my collection which is of similar importance for the history of European aviation.

The text of the document reads, in translation, as follows:



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ET COMMISSION SPORTIVE
Tél. Élysées 63-10

COMMISSION SPORTIVE

S.J/ Paris, le 48 70

RECORD DU MONDE DE DISTANCE

PRIX RAYMOND ORTEIG

20-2I Mai I927

-:-:-

CERTIFICAT D'ATTERRISSAGE AU PORT AERIEN DU BOURGET

-:-

Je certifie être parti de LONG ISLAND (près NEW YORK) à 6 heures 5I minutes 30 secondes (heure américaine) et avoir atterri au Port aérien du BOURGET (près PARIS le 2I Mai I927 à 22 heures 22' (heure française)

Paris,Le Bourget, le Mai I927
Charles A. Lindbergh

World Record of Distance
Raymond Orteig Prize
May 20–21, 1927

Landing Certificate at the Airport of Bourget

I hereby certify that I left LONG ISLAND (near NEW YORK) at 6:51:30 (American time) and landed at the air field of BOURGET (near PARIS) on May 21, 1927, at 22:22 (French time)

Paris, Le Bourget, May 1927
(*signed*) Charles A. Lindbergh

It is interesting to note that in the excitement of the signing ceremonies Lindbergh forgot to put in the date.

It is with great pleasure that I have this document published here for the first time.

[Note: Dr. Otto Kallir was for many years a well-known collector in Vienna before he came to the United States. He is known to persons interested in aeronautica on both sides of the Atlantic. His wide aeronautical interests include balloon and airship history, air mail and air-mail stamps, aviation medals, and fugitive material, of which the document he describes here is an important example.]

Letter to the Editor

Dear Sir:

Walter Fitch (A.M., H.A.) (Boeing, Wichita) won the Olive Ann Beech Trophy in the 1950 Annual International Aeronautical Literary Contest conducted by the Women's International Association of Aeronautics, Los Angeles, Calif. Awarded as a prize in the Aviation History and Biography Classification, a portion of his paper was published in the I.A.S. Goddard Memorial number of Aeronautica, Vol. 2, No. 4.

By the way, the photo on page 1, Aeronautica, January–March, 1951, Vol. 3, No. 1 is not that of a Sopwith Snipe. It is a Spad. With all good wishes.

Sincerely,
Walter Fitch
1848 Jeanette Ave.
Wichita 3, Kans.
April 4, 1951

Ornithopter Recovered

(*Continued from page 1*)

The original model submitted by Spalding to the patent department now rests in the Smithsonian Institution in Washington. The second model, which has a 10-in. wing span, was discovered in a chicken coop on Spalding's farm in 1938 by his grandson, Clarence. The chicken feathers were dusted off, and, after careful packing, it was sent to Mr. Dwiggins. This has been displayed at the Historical Branch Exhibit held in the Los Angeles I.A.S. building.

Aeronautica

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Vol. 3 JULY–SEPTEMBER, 1951 No. 3

Pioneer Aeronaut Speaks to West Coast Historical Branch

Roy Knabenshue, pioneer American aeronaut, spoke at a meeting of the Historical Branch of the I.A.S. at Los Angeles on February 16. The meeting commemorated the first International Aviation Meet, which was held in 1910 at Dominguez Field in Los Angeles. Knabenshue was one of the organizers of the meet, as well as a participant.

A large group of enthusiastic members and guests were present at the meeting, which was considered one of the most successful held by the West Coast group since they organized early last year. Among the honored guests was Gen. Frank P. Lahm (Ret.), the first U.S. Army aviator, who was taught to fly by the Wright Brothers.

Knabenshue spoke of his early ballooning days, his first airship flights at the St. Louis World's Fair in 1904, the Dominguez meet, and his connection with the Wright Brothers as exhibition manager. (Excerpts from Knabenshue's talk are reproduced on page 2.) An interesting exhibit of a portion of Knabenshue's collection of aeronautical photographs and other aeronautica was arranged by members of the West Coast Archives Committee.

A film of Knabenshue's 12-passenger airship taken in flight over Chicago's lake front and business district was shown. In addition, more than 100 slides of photos in Knabenshue's collection of early aeronautica were shown.

At the conclusion of the meeting, John J. Sloan, executive chairman of the Los Angeles Historical Branch, presented Knabenshue with an I.A.S. pin and membership card. Mr. Knabenshue is working enthusiastically with the Los Angeles group on a number of interesting projects.

Roy Knabenshue *(third from right)* shown examining photos and other data that were brought to the meeting by other collectors of historical aeronautical material.

Re Aeronautica

With this issue of Aeronautica, we are enclosing a questionnaire concerned with the specific historical interests of our members. This was attempted once before on return post cards, but poor results were obtained. If you would like to have a roster of Historical Associate members, Aeronautica subscribers, and their interests to acquaint you with your fellow enthusiasts and collectors and their whereabouts, please cooperate in filling out and returning this form. If we obtain sufficient information to make a roster worth while, we will go ahead enthusiastically with the job.

Please address correspondence to Aeronautica, 2 East 64th Street, New York 21, N.Y.

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We Did It the Hard Way*

by

Roy Knabenshue

Roy Knabenshue shown with reproductions of some of the New York newspapers that covered many of his early-day flights.

Photo by Al Schmidt, H.A.I.A.S.

WAY BACK, DURING THE FALL of 1899, I was assisting my father on the *Toledo Blade* by conducting what was called the Question Bureau—a column devoted to questions and answers. During this period we had our Tri-State Fair, located 5 or 6 miles from the center of town. A man with a captive balloon was there, carrying passengers at the end of a rope. I told Father that it would be a good idea if I looked the situation over. He said, "Go ahead. Take a camera and get some pictures."

I saw that man take in $100, and I figured *that* was the business for me. After about an hour and a half's conversation, I bought his balloon. I let myself in for a tremendous amount of trouble and hard work, but it was worth all it cost.

In 1902 I met Octave Chanute, a noted engineer who built the first steel railroad bridge across the Mississippi River. He became interested in aeronautics through Otto Lilienthal's experiments, with the results that he engaged William Avery, a cabinet maker, to make his models and had as an engineer A. M. Herring, who was supposed to make all his flights. He built eight different types of flying machines or gliders without motors and went off to a place called Dune Park in Indiana, at the southern end of Lake Michigan. There, they used a number of large sand dunes from which to make their gliding experiments.

I called on Mr. Chanute at his home in Chicago and spent a day with him. I wanted to build an airship and wanted his opinion on the type of motor to use. He advised me to go to Dayton and meet the Wright brothers. He said that they were very nice men and that they would be glad to see me.

I saw the first motor being assembled in 1902. Charlie Taylor, Wilbur, Orville, and Loren Wright, another brother, were there; however, they were not able to help me get another motor. At that time, motors weighed approximately 25 to 30 lbs. per hp. (altogether too heavy for my purpose), so I had to look elsewhere. I continued my ballooning, both free and captive work, until the World's Fair at St. Louis, and I shipped a new balloon to the Fair for the purpose of winning some of the prize money.

The St. Louis Fair decided that Europe was getting all the publicity and all the breaks in the aeronautic business; consequently, the Fair management offered $200,000 in prizes for free ballooning and for an airship that would fly over a triangular course on three separate occasions at a speed of not less than 19 m.p.h. One hundred thousand dollars was the grand prize for that event. Many people applied for entry, each contestant feeling that he was going to win $100,000.

Santos-Dumont built a special machine, his No. 7, to try to win this prize. Dumont was a very wealthy man, son of a Brazilian coffee planter, and he did not need the money, but he wanted the honor. I was in the office of Willard Smith, Director General of Transportation, the day Dumont arrived in New York City, and I heard the telephone conversation that led me to believe that there was no prize money that could be offered. In other words, the Fair had borrowed a very large sum of money from the Government with which to finish the buildings. As a result, the Government seized the gate receipts and all the prize money. When Dumont was met in New York by a man who offered him $5,000 for a single flight on the 4th of July, he indignantly refused, saying, "I'm a sportsman. I'm here to win that prize. It isn't the money I want. This 4th of July flight is out of the question."

I was in the hangar with some of the boys who work on the field when his goods arrived. Dumont had a crew of about ten Frenchmen who could not speak a word of English. They removed the top of the crate containing the balloon, looked it over, saw that it was in good condition, and then loosely put the cover back again. That night somebody got in, removed the cover, and with a knife cut the balloon all to pieces. The following morning when Dumont came into the hangar and saw what had occurred, he sat down and shed tears. I felt sorry for him, but there was nothing that could be done to help him.

A little later Baldwin came in, or rather Ed Carpenter representing Baldwin, and said, "Knabenshue, maybe you can help me. We want to get paid for some flights and don't know who to see." I replied, "I'll take you down to Mr. McGarvey." All these men at the heads of the departments had rather fancy titles. McGarvey was Director General of Publicity. Willard Smith was Director General of Transportation, and so on down the line. They all were Director Generals. I introduced him to McGarvey, and I told him that Tom Baldwin built this machine and I would vouch for it. The result was that a contract was made for five flights, at $1,000 a flight; however, I'm not sure about the price.

Excerpts From the *New York World*, August 27, 1905

"Who was the most-talked-of man in New York during the past week?

"Ask Fifth Avenue, Wall Street, the Bowery—east side, west side—everybody from Harlem to the Battery, and then ask every commuter for twenty miles around the greater city and they will all tell you—Knabenshue, the airship man. The man who sailed over New York—downtown and back again—two successful flights on two different days."

Who Knabenshue Is

"A. Roy Knabenshue, the man who has made New York wonder, is twenty-eight years old and the son of S. S. Knabenshue, formerly editor of the *Toledo Blade*. He has been ballooning ever since he was out of his teens. Last year he made the first really successful airship flight ever made in the United States, navigating Capt. Thomas Baldwin's 'California Arrow' with perfect success over the St. Louis World's Fair. Later he went to the Pacific Coast with Capt. Baldwin and at Los Angeles established further reputation by the daring and complete success of his flights. Today he stands preeminent in his profession and will go down in history as the first man who ever successfully sailed over New York City in an airship."

Then Baldwin made an agreement with me, saying, "If you'll do the work and do what I tell you to do, I'll split the profit with you." I agreed and worked hard and built the frame, a triangular affair made of spruce with bailing wire at the cross members.

Baldwin had purchased a Curtiss motorcycle engine from some boy in San Francisco. Since the boy could not make it run, Baldwin paid him $10 for it. He had a mechanic fix it up, and that was the power plant. Then there was a shaft of steel tubing about 12 or 14 ft. long, at the end of which was a propeller 10 ft. in diameter. I had to make the hydrogen gas because we could not buy it. After the balloon had been filled and rigged up, Tom got on the frame and found it would not lift him (he weighed about 210 lbs.), and he said, "Well, I guess it's up to you."

The day was selected for the first flight; an announcement was made in all the newspapers, and a crowd collected to see this machine in flight. However, the motor was not working well. It was out of time and vibrated so badly that I could hardly stand on the frame. Quite unexpectedly, Baldwin gave the signal to let go, and away we started. First there was a dash for the big hangar, and I steered away from that; then there was a dive for the fence. I just got over the top. Then we twisted around and headed for the dome on the Brazilian building, which I managed to escape by just a few feet. Then we headed straight into the ferris wheel.

I figured that my troubles were many and did not know whether I was going to get down again, but, by carefully manipulating the rudder ropes, I found that my trouble had been overcontrol. When I pulled to the right, I quickly turned the rudder in the opposite direction and gently eased it off. Consequently, I was able to make a complete turn. I went around the ferris wheel, around the Transportation Building, and then back again almost over the spot where I had started. Then, for no good reason at all, the motor coughed and died, and I started a very interesting balloon trip!

With the motor dead, I had no control except my altitude, so I sought an elevation of 6,000 or 7,000 ft., crossed the Mississippi River, and landed in a cornfield in Illinois. That was the first flight in America in which a man had been able to control an airship, and it is recorded in history as such.

After we had made five flights, Baldwin and I went to Los Angeles and set up in old Chutes Park, located at the corner of Washington and Main Streets. There was what appeared to be an old barn on the back end of the lot, which I was told was the first theater ever erected in Los Angeles and which we used as a hangar.

On Christmas day, 1904, I took off and made a trip over the city and back again to almost the spot from which I had started. The same performance that we had had in the first flight in St. Louis was repeated. I landed the ship in the river bottom; I do not remember just where. Since we could not get the motor started again, we deflated the balloon and carted it back again to the park.

In the spring of 1905, Baldwin and I separated. He went to Portland to make a number of flights at the Portland Fair. He engaged Lincoln Beachey to fly for him. In the meantime, I built a small balloon out in Chutes Park and made arrangements with the management to make three balloon ascensions. I was to be paid $125 per flight. In order to finance myself, I had to borrow $50 from Henry Cook, the manager of the park.

I bought a supply of Lonsdale cambric for the balloon and No. 36 seine twine for my netting. Three of the neighborhood ladies sewed this balloon for me on their sewing machines. In five days I was in the air. In the first ascension, I took off and got into a number of different air currents, for which this whole valley is noted. By making a record of the elevation of each current, I was nearly able to get back to where I had started. I managed to land within five blocks of Chutes Park, after having been in the air for over an hour.

The second ascension was extremely interesting. It had been raining for two or three weeks. Everything was soggy, and mud was hub-deep. I took off in an overcast sky. Perhaps 800 ft. was the ceiling of the clouds, and I left with such a speed that the balloon made a hole in the clouds. On gaining altitude above them, I could look back through that hole and see Chutes Park, my starting point. Then I saw the clouds fold together, and there I was, up about 8,000 ft. in a blazing sun, getting sunburned without realizing it. Looking down on the clouds, I could see the shadow of the balloon clearly outlined even to the trail-rope hanging. It made a very impressive picture. I then commenced to look around for possible landings. I did not see the ground anywhere. There were three peaks sticking up above the clouds. One was Old Baldy, another was Mt. San Antonio, way down the valley, and the third one was Palomar. I heard a band playing a funeral dirge. At least, I thought, that was what it was, but the band was playing "Nearer My God to Thee." I was up 9,000 ft. by this time, drifting along, where, I did not know. Surely, I felt, I was "nearer my God to Thee."

Looking off toward the south, I saw an opening in the clouds, and I could see clearly marked on the ground what resembled a wagon wheel, with a building where the hub would be, streets marking what would be the spokes, and then roads all around the town. That was Corona. I came down to get underneath the clouds and made a landing in an alfalfa ranch on property owned by Mr. Simpson of Arlington. I made that trip in 45 min., and it required 1 hour, 20 min. to get back by train.

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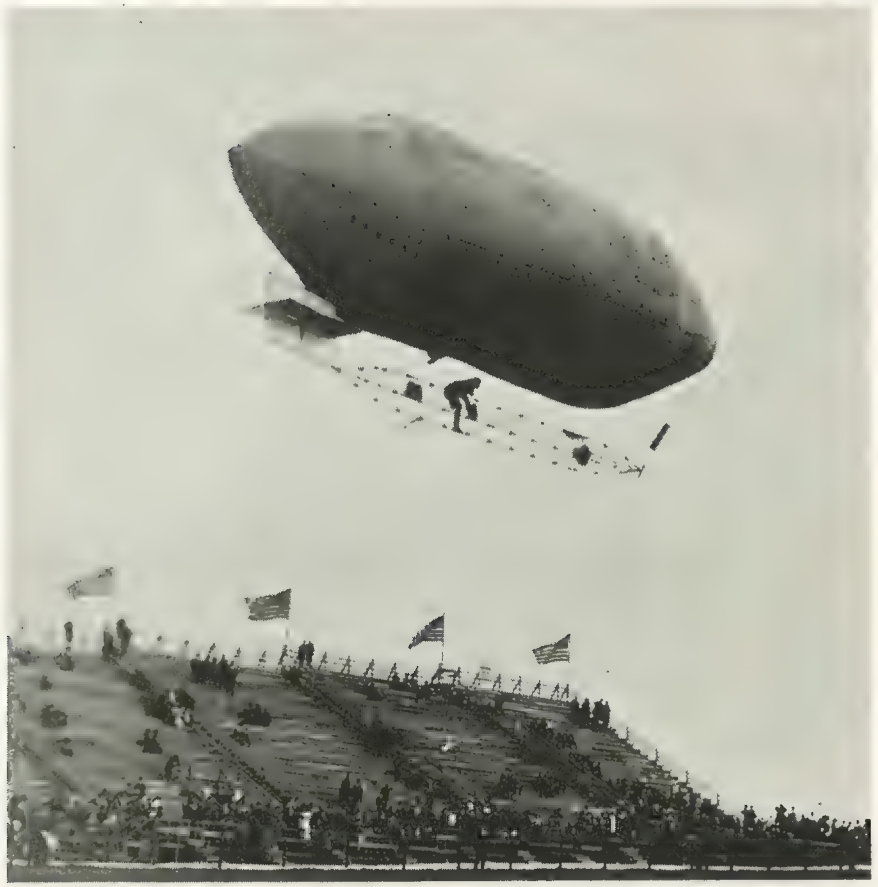
* Based on a talk given at a meeting of the Historical Branch of the I.A.S. at Los Angeles.



Roy Knabenshue is shown maneuvering his airship over the International Aviation Meet in Los Angeles in 1910. The airship held 6,000 cu.ft. of hydrogen gas and was powered by a four-cylinder converted air-cooled motorcycle engine. Directional control of the ship was maintained by a rudder that was manipulated by ropes. The ship was made to climb or descend by the operator who slid forward or aft on the triangular frame.

There is one other story I would like to tell you about my ballooning days. When I was making free-balloon ascents, I used to get $500 for such ascensions at small country fairs. They usually lasted three or four days, but, when there was a three-day engagement, I had to make all three flights to cover my expenses.

On one occasion I had made two trips nicely, but, on the third trip, the wind was blowing extremely hard. I did not know whether I would clear everything, but fortunately I did and commenced to look about for a place to land. There was not a place that looked safe enough for me to try. Finally, I saw ahead of me a big barn with a cupola bristling with lightning rods. I thought that if I could drop in behind that barn, I would be able to land without dragging. I got down as low as I dared. As I approached the barn, there seemed to be a downdraft ahead of it, and I struck the slanting roof with such force that I was knocked clear out of the basket. I slid down on the opposite side and landed headfirst in a manure pile. It's just one of the little things that occurred to make life interesting for a young man who was trying to get along in the world.

After Baldwin and I had separated and I had made my free balloon ascensions, I returned to Toledo and designed what was the first streamlined airship in America. It only held 6,000 cu.ft. of gas. I bought four motorcycle cylinders from the Consolidated Manufacturing Company, which manufactured the Yale motorcycles. I bought the cylinders, the pistons, and connecting rods. Then I designed the crankcase, the balance, and the motor and assembled the parts. Believe it or not, at the first turn of the crank that motor commenced to purr. I had great success with it.

I figured it would be advisable to make a series of flights in Toledo for publicity purposes; thus, we set up on the fair grounds—the same grounds where I had bought my first balloon. In preparing for the first flight, I assembled everything in a hurry and overlooked a great deal of detail. I took off, got up to about 2,000 ft., and found I was able to steer it alright. Then I moved forward on the frame to bring it down again. The rear end of the netting began to let loose and started to roll up and over the top of the balloon. I realized that if something did not happen quickly I would be dashed to pieces, but, fortunately, the rudder post fouled with the silk of the balloon proper, and it held from going any further. I was able to get down and was mighty thankful that I could stand on two feet again.

That was the first real thrill I had in this airship. The second one occurred in New York on the second trip. I was downtown over the city, and coming back somewhere over Third Avenue the ship gave a lurch, and I actually fell off. My right foot caught in the cross wires, and I found myself suspended headdown. I reached up, and with my right hand got hold of the lower rail and pulled myself back again. I finally landed in Central Park.

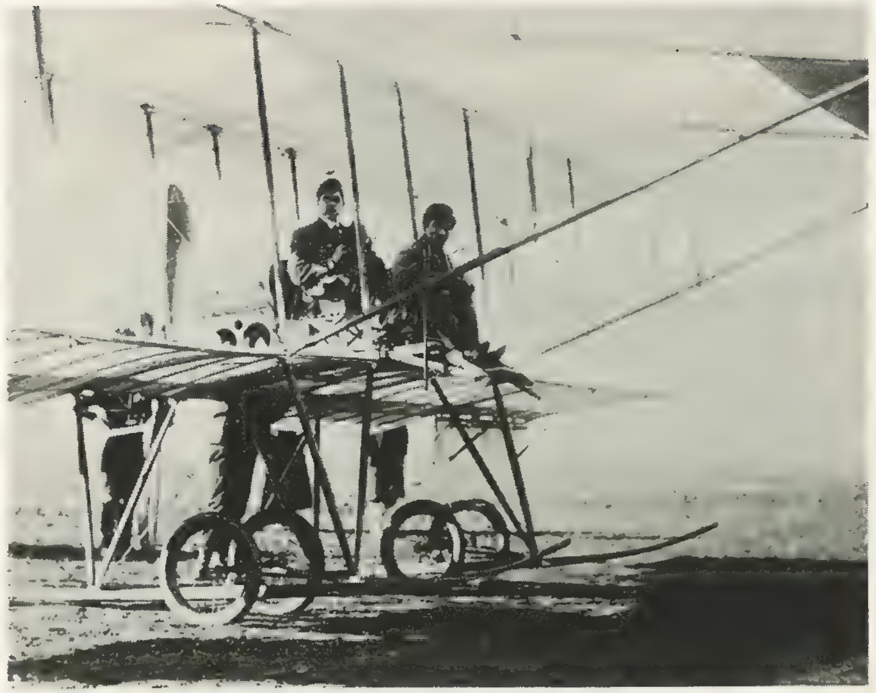
That taught me another lesson. I could neither walk on the side of the framework nor straddle it. I had limitations as far as the cordage was concerned; I could travel only so far. Something would have to be done. I decided to build another kind of ship where I could sit down and would not be subjected to the possibility of being killed.

During the winter of 1905 I returned to Los Angeles. My friend, Al Reynolds, had built a hangar at what was known as Fiesta Park at Hope and Pico Streets. I moved in, built a hydrogen plant, and inflated the balloon. Then I built a frame, which was a short affair with a pair of propellers, one on each side, run by a belt. Behind each propeller was a couple of aeroplanes, which could be deflected up or down, and the usual vertical rudder. I was able to handle the ship nicely up to the point where I applied all the power. Then, because the center of thrust was below the center of resistance, the ship would automatically point up, and I was not able to bring it down except to cut the speed down. As a result, I landed in Pasadena and decided I did not want any more of that.

I returned to Toledo and there built a balloon with what, I recall, was a well in the center of the car, with some very thin planks to walk on. I tried it at the Polo Grounds in New York City and found that it was not satisfactory. I could not move far enough in case of emergency. Thus, I reverted to the original type of standing on the outside.

I then built two balloons exactly alike—probably the smallest dirigibles that were ever built and operated in America. Lincoln Beachey became my partner. That was the year 1909, and we actually raced these two ships around a one-mile race track. The operator who could maintain the lowest altitude would usually win out.

I want to stress some points about the anniversary of the first International Aviation Meet held in America at Dominguez Field. There is a great deal to be said about that. In 1909, Beachey and I attended an aviation meet sponsored by A. B. Lambert and held in St. Louis at Forrest Park. Along with us was Glenn Curtiss. There had never been a flight in the city of St. Louis with a heavier-than-air machine. Curtiss actually got off about 4 or 5 o'clock one morning before the wind came up, and he made a flight that fired the imagination of everybody in St. Louis. So I talked to Curtiss and urged that we do something to perpetuate aviation.



A *Los Angeles Examiner* photographer is pictured going aloft in a Wright machine to secure aerial pictures of the first International Aviation Meet.

"Would you be willing to go to Los Angeles this winter and assist in holding an aviation meet?" I asked him. He said that he would be delighted, and I suggested the same thing to Charley Willard and Charley Hamilton, both of whom agreed to come along. Hugh Robenson of St. Louis also agreed. Then I went up to Minneapolis and saw Dick Ferris, whom I had met in Los Angeles the previous winter, and I put the proposition up to him. I suggested, "You go back and prepare the way and we will put on the aviation meet."

Dick Ferris came back here, looked the situation over, and talked with Max Ihmsen of the *Los Angeles Examiner*. Mr. Ihmsen got the idea right away. He said, "We'll make it an *International* aviation meet." He wired their representative in London, and he made arrangements with Edmund Cleary, who brought over two Farnam and two Bleriot planes with Louis Paulhan, and Masson, and Miscarrel. The question was, where was the meet to be held? Then I discovered that Pacific Electric had an interest in where the meet would be held. One of their representatives had me go with him to Dominguez Hill, way off in the sticks at that time. "Do you think you could fly off this hill?" he asked me. I said that I thought it would be ideal and that anybody who would come this far to see these men fly would pay 50 cents admission to get onto the grounds to get a close view. He replied, "Alright, we'll have it here."

Instead of the grandstand's facing east, as is the case in all race tracks, it faced north, which was just as good. Paulhan, Masson, Miscarrel, Glenn Curtiss, Charley Willard, Charley Hamilton, Hillary Beachey, Lincoln Beachey, and I were the performers. We put on a ten-day meet at 50 cents admission and $1.00 for a box, and the last I heard was that $137,000 had been cleared.

During this meet I received a telegram from Wilbur Wright. He said, "We're ready to talk business. Come at once." I wired him that as soon as the meet was over I would be in Dayton. After haggling around for about three weeks, we made a contract in which I became the General Manager of the exhibition department. I personally was not to do any flying, and furthermore we were not to fly on Sunday. The father of the Wright brothers was a Bishop in the United Brethren Church, and he had very strict religious ideas about flying on Sunday. There we were, handicapped right from the start, because the best day of the week, when everybody could get out to see the show, would be Sunday.

I think the last figures I had were about $750,000 in contracts for 1910 and about twice that amount for 1911. After breaking up about 18 or 19 planes—and I lost two boys—we still had a net profit of over $500,000. The business was extremely profitable. Today you could not possibly do that. There would be no place to hold an aviation meet, and I do not think anyone would have the initiative to try to hold an aviation meet such as we produced in the early days.

Photo by Al Schmidt, H.A.I.A.S.

Roy Knabenshue and Frank P. Lahm examine a 10-ft. wooden propeller used on one of the early Wright machines.

Anything New Under the Sun?

Long Range Forecasting of the Future Trends of Aircraft Design Has Been a Favorite Sport Since Flying Began. Here Is a Striking Example from a Little-Known Source of "Aeronautica" of About Half a Century Ago.

*by S. Paul Johnston**

43 70

One of the projects long since tucked away in my "things-to-be-done-someday" folder has been the compilation of the various forecasts of the future of flying that were made by the serious practitioners of the art up to the end of the first decade of the Twentieth Century. I would exclude the Jules Vernes, the A. Conan Doyles, and others who drew largely upon fertile imaginations, hunches, and wishful thinking and concentrate on those men who were then making serious and scientific contributions—men who were actually flying airplanes and who already had some firsthand experiences on which to base their prognostications. They, at least, knew enough to be cautious. It was a brave man indeed who would admit in those days, even in private, that speeds in excess of 100 miles an hour might be attainable. And, yet, some of their ideas of aircraft design, committed to paper well over 40 years ago, come surprisingly close to some current design concepts.

Leafing through a set of bound volumes of a French publication, *Je Sais Tout*, for the years 1906 to 1909, I recently ran across a mine of useful material that well supports that point of view. This magazine was, in reality, not stretching the truth too seriously in its titular claim to universal knowledge. It did keep an eye on practically everything that was newsworthy in its day—sports, fashions, poetry, theatrical arts, politics, and, especially, science. In the latter field, its editors were intrigued by new discoveries on all fronts and were successful in persuading the leaders in the several branches to express in its pages their views as to the future possibilities of their specialties.

It is amazing how accurately some of the developments of today were foreseen. For example, although "wireless telegraphy" and "cinemaphotography" were but barely in the laboratory stages, radio broadcasting and television were described (almost in modern terms) as imminent probabilities. Out of the embryonic motor cars of the times came clear concepts of modern automobile and bus transportation, and even of modern mechanized warfare with horrendous pictures of battles of armoured mechanical monsters! In such an atmosphere of scientific curiosity and interest, it is not to be wondered at that the problems of mechanical flight came in for a full measure of attention.

One of the great aviators of the times was Henri Farman. By 1908 he had established several world records for speed and endurance in box-kite biplanes of his own design. In the issue of *Je Sais Tout* for July 15, 1908, he told the story of how (and why) he had become an aviator.

Farman was not of the hornyhanded mechanic type. He was an artist, a man of great sensibility, who coupled a native ingenuity with a philosophical approach to the problem of flight.

He loved speed. He raced bicycles, motorcycles, then automobiles. Often during a race he sensed the feeling of "solidity" of the airflow around him and speculated that, if his racer could be fitted with "sustaining planes" of some sort, he might actually leave the ground. Then, too, he was not unaware that, once off the ground, the problem of "stability" would become of the utmost importance.

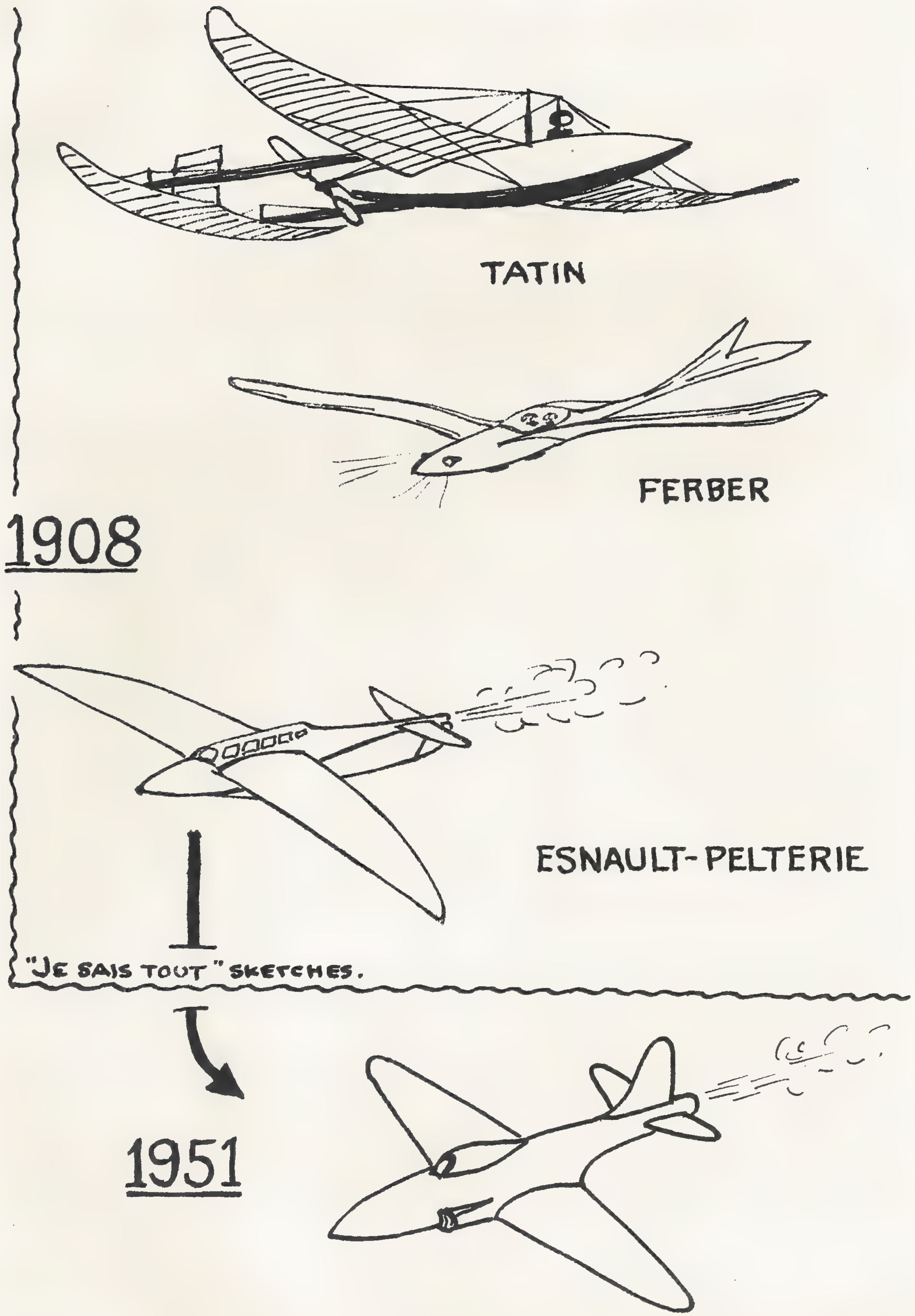
He examined all published references to heavier-than-air flight on which he could put his hands. The success of Santos-Dumont at Bagatelle on September 13, 1906, touched off the spark. From then on, his every thought and act led toward the solution of the problems of flight.

A reference to the work of the Wrights in his article indicates how little was known in Europe even as late as mid-1908 of their long standing successes at Dayton, after the Kitty-Hawk experiments. He says, "Several publications, notably *L'Aerophile*, had noted, with reserve, the curious and mysterious experiments of the Wright Brothers at Dayton, Ohio." That is all; and yet by 1908 the Wrights were regularly making controlled cross-country flights of long duration and were actually on the point of demonstrating their machines in France! [In the issue of 15 September, *Je Sais Tout* made ample amends for such editorial ignorance by publishing their first picture of a Wright biplane in flight with the following caption, "The American aviator Wilbur Wright has just performed numerous experimental aeroplane flights in the vicinity of Le Mans which far exceed anything that has been done heretofore and which confirm the flights reported in 1905." Later issues contain numerous articles on the subject, including one by Wilbur Wright himself.]

There is no intention here to repeat in detail Farman's account of his aeronautical education. Suffice it to say again that by 1908 he was recognized as one of the great airplane designers and pilots (invariably synonymous in those days) and that his views as to the future of aircraft design therefore deserve serious consideration in retrospect.

With only a series of somewhat limited experimental flights and without benefit of wind tunnels or of extensive laboratory analysis, he foresaw the necessity of "streamlining" everything exposed to the air, even if more weight were added. In a day when weight was the *bête noir* of designers and every airplane had the appearance of a perambulating clothes dryer, Farman wrote, "Weight has less importance than resistance to penetration (of the air). A part of fuseform shape is to be preferred over one of greater air resistance even though the latter is lighter." He found that he was able to extend his flights by adding canvas fairings to exposed parts of the structure.

Some experiments of 1908 came very close to "modern" design concepts in forecasting aircraft "of the future."



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* Director, I.A.S.

Farman recognized the difficulties and the dangers of low altitude flight and forecast longer, safer, and more comfortable flights when the upper atmosphere reaches could be utilized. (In those days altitude records were measured in "tens" of feet, and no pilot was ever free of the effects of near-the-ground turbulence.) He also anticipated correctly that higher flight speeds (well beyond the stalling point) were necessary for safety and satisfactory control.

To illustrate his article and his own views, Farman and the editors of *Je Sais Tout* discussed the future of airplane design with a number of other experimenters of the period. A series of sketches was submitted, several of which are reproduced here.

This brings us back to our sheep (as the French say)—i.e., to our original thesis that the experimenters of 40 years ago made some fairly close guesses of the trends of design today. Tatin's concept of a thin-winged monoplane, with boom supported stabilizers and a pusher propeller behind a well-streamlined fuselage, is not too far removed from some of the light plane designs of recent years. Ferber's was more of a "dream boat," but it does forecast the closed cabin, unbraced monoplane type with retractable landing gear. (The headlights are useful too!) What sort of propulsion he would employ is not clear. Perhaps his machine was intended to be a glider. We do recall some recent sailplanes that bear a striking similarity to this sketch of 1908.

But coming to Esnault-Pelterie, we do get a bit of a jolt, for his concept has in it all the elements of today's aircraft—jet propulsion, and all! Note also the tapered cantilevered wings, cockpit enclosure, and retractable landing gear. Only the keel and rudder arrangement would not meet the approval of today's designer.

Esnault-Pelterie was, of course, well ahead of his time throughout his career. His R.E.P. monoplanes of the 1910 era embodied thickish unbraced monoplane wings, multibladed steel propeller, bicycle type (tandem) undercarriage, and last—but most important in its later implications—the now universally used "stick" control.

These few examples of forward thinking design of many years ago are not of any earth-shaking importance today, but they do bring us back to the question profered in the title of this article—is there anything new under the sun in this aviation business?

Actually, of course, there are many, many things that are commonplace in aeronautics today which never entered the minds of the experimenters of 1908–1910. The complex electronic devices for communication, navigation, and military purposes were wholly beyond their ken. But that some of them had evolved, largely by intuition, some sound aerodynamic ideas is beyond all question. These few examples culled from an almost forgotten publication of the day show that some design concepts generally considered "very modern" are not quite as new as we may think.

43 70

Wood 'n Wire

We were extremely pleased to receive our first copy of *Wood 'n Wire*, the new bulletin of the Historical Branch of the Los Angeles Section. It is not only well written and interesting but also shows a tremendous amount of enthusiasm and initiative on the part of the West Coast members. It was sent to all H.A. members on the West Coast and also to more than 125 nonmembers. If any others would like to have a copy, contact Miss Helen J. Kulp, the new Secretary of the Branch.

The bulletin tells of activities of special interest to the Branch, forthcoming speakers and plans, and latest additions ~~to the Archives.~~ ~~Material for the next~~ issue of Aeronautica will be prepared and written by the Los Angeles Historical Branch, and it should prove to be a most interesting issue.

Congratulations are in order to all who had a part in the preparation of this bulletin and especially to R. B. Johnston, Executive Chairman, Ed Stickle, Executive Vice-Chairman, Helen J. Kulp, Secretary, and Harry Gann, Treasurer.

The Traders' Corner

In another issue of Aeronautica, we started a column by this name in hopes that we might have some interesting results. It has not been continued because we have had no material to use. Whenever we do, however, we will be glad to publish the news.

FOR SALE

Full set of seven original Curtiss-Wright first flight aviation prints. Please contact owner through Aeronautica.

Word has been received that the Aeronautica Collection of Mr. Edward L. Sterne is available for sale at the Argonaut Book Shop, 332 Kearny Street, San Francisco 8, Calif. It contains a "Selection of Books, Pamphlets, Periodicals and Ephemera Relating to All Phases of the History of Aviation." Information may be obtained at the Argonaut Book Shop or through Aeronautica.

FOR SALE OR TRADE

Owner of four First World War planes and some accessories is anxious to buy or trade with other collectors and to get in touch with members interested in First World War planes, engines, and armament. Contact Frank G. Tallman, III, 2010 Pratt Ct., Evanston, Ill.

Paul K. Guillow

Paul K. Guillow died on August 28 in Wakefield, Mass., at the age of 54. He was the owner of Newcraft Toys, airplane model and model kit manufacturers. He was a devoted student of the history of aviation, one result of which was his activity in the development of historical airplane model collections. Mr. Guillow gave his first collection of 27 heavier-than-air models to the Institute of the Aeronautical Sciences in 1945 and later gave a collection to the Civil Aeronautics Administration. At the time of his death, he was engaged on a model project for the Boston Museum of Science. His models of gliders flown by Cayley, Chanute, Wenham, Lilienthal, and the Wright Brothers and of the Henson, Wright, Langley, and Penaud aircraft were made after detailed research and comparisons of available data and were typical of his approach to the problem of making accurate historical models. Mr. Guillow developed models also for technical research, among others for the radar laboratory at the Massachusetts Institute of Technology, where he studied as a youth. He studied also at the Carnegie Institute of Technology and the Columbia University School of Business. During World War I, he served as a Naval Aviator.

Mr. Guillow is survived by his wife, Gertrude, his mother, Mrs. Susan Guillow, and a brother, Roscoe.

Aeronautica

Published by the
Institute of the Aeronautical Sciences, Inc.

Vol. 3 FALL, 1951 No. 4

Re Aeronautica

An explanation for the late appearance of this issue, and an announcement of a new policy and program for the future

This is the last of twelve issues of Aeronautica in its original form. Started in the Spring of 1949 as a quarterly bulletin for the aeronautical archivist, it has now rounded out 3 years as originally planned. Increasing interest and increasing circulation have given reason for a restudy of the magazine, and, as a result, certain changes in format and in management have been agreed upon, as outlined below.

First, however, a word of explanation as to the lateness in appearance of Volume 3, Number 4—this issue. During the summer of 1951 it was agreed that the Los Angeles group of Historical Associates would undertake the preparation of the final quarterly issue of the year. The members of that group attacked the problem with great enthusiasm and turned in a remarkable result, as will be seen from a reading of Volume 4, Number 1. Several problems arose, however, which postponed publication. Preparation time was longer than anticipated, and the projected production costs exceeded our somewhat limited budget. Furthermore, the concept and the format prepared by the Western group was so different from previous issues, that a restudy of the whole project seemed in order. Meanwhile, we ran into the period of preparation for the Institute's Annual Meeting, which tied up our entire printing and production departments and further delayed publication.

In the end it seemed best to round out Volume 3 with this small issue (to be mailed out with Volume 4, Number 1 in expanded form) and to shift over to a new editorial program as suggested by the work of the Los Angeles Historical Associates.

Beginning with the first quarterly issue of 1952, the editorial direction of Aeronautica will be in the hands of Ernest W. Robischon, our Western Region Manager. Mr. Robischon was a member of the Archives Committee in 1949 which recommended the initiation of the magazine. He himself has a long standing interest and experience in the field of historical aeronautical research and collection and is particularly well fitted to carry on our Historical Associated Publication. He will have the enthusiastic support of the local group that did such an outstanding job with the new issue.

In connection with his responsibilities for this magazine, Mr. Robischon will have general charge of the Durand Aeronautical Museum of the Institute, which is described in an adjoining column.

Subscription rates for Aeronautica will not be changed. It is included as a part of the $10 membership fee paid by Historical Associates. Regular members of the Institute, including Student Members, may participate in Historical Associate activities without payment of additional dues and may subscribe to Aeronautica for $1.00 per year.

Dr. William F. Durand.

Durand Museum

Announcement of establishment of a new activity in the Los Angeles Headquarters Building

An item that should be of considerable interest to all I.A.S. members, and particularly to the Historical Associates, is the plan for establishing a museum at the Western Region Headquarters in Los Angeles. The museum, which will be named the W. F. Durand Aeronautical Museum of the Institute of the Aeronautical Sciences, Inc., will be established with funds donated by the Durand Reprinting Committee, which has recently been deactivated.

The primary objective of the museum will be to preserve aeronautical history. However, procedure that will be used is different in concept than that followed by most museums. The exhibits will

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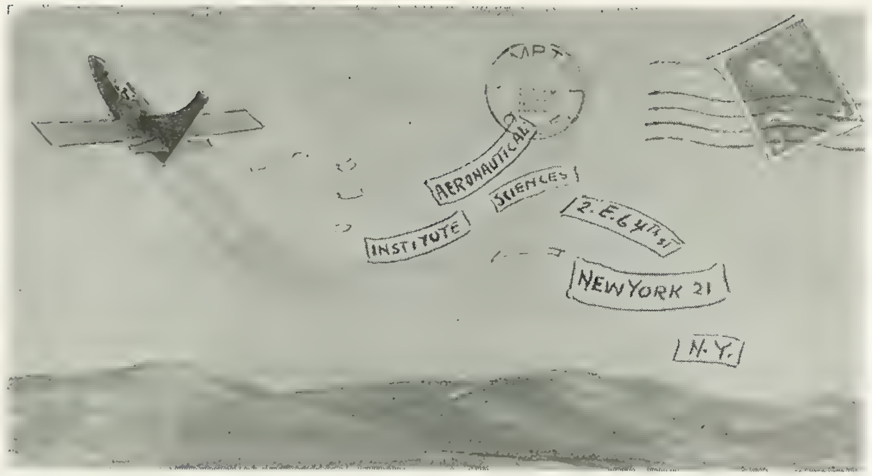
be designed not to portray history for history's sake but to show how history can be used as a tool for the present and future. As the exhibit space available is limited, considerable care and planning will be exercised in choosing exhibits. There will be a limited number of permanent exhibits, which will include a full-scale replica of the "Wright Flyer" and a photo mural depicting the development of the Air Force. Other changing exhibits will be chosen for their importance to engineers, and such subjects as the evolution of airfoil development, development of landing gears, evolution of fighter design, etc., are planned. Supplementing such exhibits, which will be displayed in cases, will be those prepared by organizations such as the Historical Branch of the Los Angeles Section and the Early Birds. These will concern outstanding personalities and events that may be represented by material from either the collections of these groups or the individual members thereof.

It is hoped that this Museum will prove an inspiration to all persons interested in aeronautics. It is planned that the Museum will be open to the public.



Envelope received by I.A.S. shows artistry of D. P. Germeraad, T.M.I.A.S., Engineer with Consolidated Vultee Aircraft Corporation. It was done in water color.

43 70

Curator Resigns

Mrs. Hamilton leaves New York Museum for domestic fields

Mary Morgan Hamilton, who for the past 2 years has been in general charge of the Institute's Museum on the second floor of the 64th Street Building, has resigned to devote her attention to more prosaic duties in the domestic field. She came to us after 3 years' experience in the New York Wings Club. During her stay with us, she "doubled in brass" in that she also conducted the affairs of the American Helicopter Society (an I.A.S. Affiliate) as its paid Secretary.

In the winter 1950–1951, the Goddard collection of early rocket material came to the Institute through the courtesy of Mrs. Esther Goddard. Mrs. Hamilton spent many hours with Mrs. Goddard and with many of Dr. Goddard's early associates in cataloging and in classifying the hundreds of lists and pieces and in sorting them out for display. She was also active in the final setting up of the Exhibit.

As a part of her duties, Mrs. Hamilton was responsible for the general collection of material for AERONAUTICA. This function has been transferred to our Western Headquarters office, as mentioned earlier in this issue.

From the Guggenheim and Landauer collections of rare old prints housed in the I.A.S. Headquarters Building, New York.

Print of the model of the Henson Ariel in the I.A.S. Museum.

NOTICE

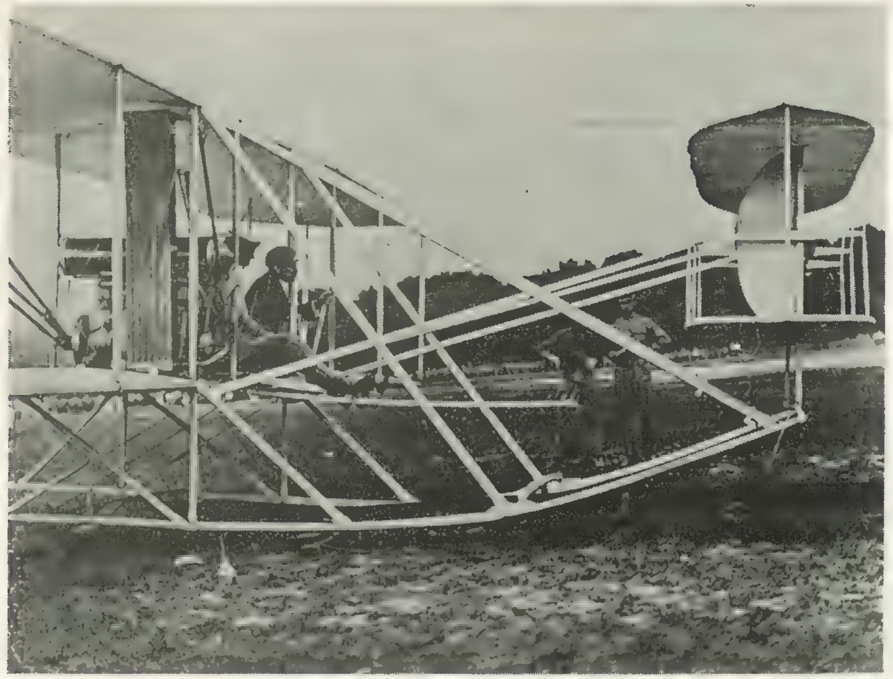
All correspondence regarding the editorial content of AERONAUTICA or relating to editorial contributions should be addressed to:

The Editor
AERONAUTICA
Institute of the Aeronautical Sciences, Inc.
7660 Beverly Boulevard
Los Angeles 36, Calif.

AERONAUTICA

Official Publication for Historical Associates

Vol. 4 JANUARY–MARCH, 1952 Number 1



The world's first military airplane. The Wright machine at Fort Myer, Va., on September 9, 1908. Orville Wright piloted Lieutenant Lahm (now Brigadier General), around Fort Myer in the first military acceptance trials. The Signal Corps Spec. No. 486 stated that such a machine should carry two persons for a flight of 125 miles at a minimum speed of 40 m.p.h. and should be easily disassembled for transportation in an Army wagon.

MEMOIRS OF FORT MYER

BY FRANK P. LAHM, BRIG. GEN., U.S.A.F. (RET.)

EDITOR'S NOTE: In any issue of an historical aviation publication, it always seems appropriate to honor the Wright Brothers. Since their construction of the first military airplane has had the most profound effects upon our world, we are fortunate to be able to reproduce the following eye-witness account of the Wrights' original demonstrations to the U.S. Army.

History was made across the Potomac from Washington in 1908 and 1909. For the first time, the American public was to see an airplane skimming through the air right before their eyes. As a matter of fact, the Wrights had made their first precarious flight at Kitty Hawk, N.C., nearly 5 years earlier, then spent 2 years eliminating the bugs and bringing their invention up to a point where they knew it had real value, a practical vehicle of the air.

It took the War Department nearly 3 years to be convinced that the Wrights were not just a couple of cranks who had an idea and wanted Government funds to perfect it. The Board of Ordnance and Fortifications had given Professor Langley $50,000 for his experiments with a machine that never

(*Continued on page 9*)

GENERAL LAHM

The long and distinguished career of Frank P. Lahm, Brigadier General, U.S.A.F. (Ret.), has included a record of many "firsts." He was the Army's first airship pilot and the first service pilot to be trained by the Wrights at Fort Meyer.

In 1906, under the tutelage of his father, himself a pioneer aeronaut, he won for the United States the first Gordon Bennett International Balloon race. This flight, with Major H. B. Hersey as aide, was from Paris to northern England, a distance of more than 400 miles. Following his early training at Fort Myer, with such classmates as Arnold, Foulois, and Humphries, he helped to shape the destiny of the fledgling eagle which was to become the United States Air Force.

In the first World War he commanded the air service of the Second Army, A.E.F. Between World Wars I and II he served as Air Attaché in Paris. At the time of his retirement in 1941, he was in command of the Gulf Coast Air Corps training center, with the rank of Major General.

General Lahm has been active in the Early Birds organization since its inception, having twice served as its national president. As aeronautical history has been his lifelong hobby, he has followed with keen interest the activities of the Historical Branch of the Los Angeles Section, I.A.S.

R. L. B.

AERONAUTICA

Official Publication for Historical Associates

CONTENTS

VOLUME 4 **NUMBER 1**

FEATURES

Memoirs of Fort Myer, by Frank P. Lahm, Brig. Gen., U.S.A.F. (Ret.). 1
General Lahm, by R. L. Bliss 1
Lost by Lockheed, by P. A. Beck 3
Ace Photographer, by W. B. Ames 5
Tin Goose, by R. J. Clark 6

DEPARTMENTS

Editorial 2
Trader's Corner 2
Aerial Post 2
News from Here and There 9

STAFF, THIS ISSUE

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R. L. Bliss   Harry Gann   Helen J. Kulp   John J. Sloan

AERONAUTICA is published quarterly for the Historical Associate Members of the Institute of the Aeronautical Sciences.

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EDITORIAL

This issue of AERONAUTICA (beginning a new year) comes to you with a new look and a new address. Originally intended to be a single issue prepared by the Historical Branch of the Los Angeles Section, it is now planned that the publication of AERONAUTICA be the responsibility of the Western Region Headquarters staff. We hope that the move to the region showing the most activity in historical matters will not only add impetus to their program but will produce results of interest to all AERONAUTICA readers.

AERONAUTICA is a publication for all of the Historical Associates. For that reason we want to cover as much ground as possible in the space we will have available, so that the final result will be a publication that is pleasing to all who are interested in any phase of aeronautical history. We wish to point out that we will not overlook the special needs of collectors interested in items concerning dirigibles, gliders, early racing planes, stamps, medals, or other forms of aeronautica. All of these and many other fascinating subjects of aeronautical history will be covered from Icarus to F-86.

We wish to solicit your comments and criticisms, but particularly do we wish to solicit your assistance. AERONAUTICA is for you. Only if we are appraised of your interests may we produce a publication that satisfies you. Surely, we all have specialized interests and desires that should be made known to the over 500 readers of AERONAUTICA. Please write us and make your wants known, and don't forget that we are depending on you also to submit your ideas and thoughts for publication. Address all communications to:

Editor, AERONAUTICA
Institute of the Aeronautical Sciences
7660 Beverly Blvd.
Los Angeles 36, Calif.

PHOTO CREDITS

Page 1: (*Left*) F. P. Lahm; (*right*) A. U. Schmitt. Pages 3 and 4: Lockheed Aircraft Corportion. Page 5: E. G. Dyer. Page 6: (*Top*) H. Gann; (*bottom*) W. M. Bodie. Page 7: (*Upper left and bottom*) W. M. Bodie; (*upper right*) North American Aviation, Inc. Page 8: (*Left*) R. R. Martin; (*right*) J. J. Sloan. Page 9: A. U. Schmitt. Masthead drawing by E. Bell.

TRADER'S CORNER

BY BILL AMES

Initiated in a previous issue of AERONAUTICA, the Trader's Corner is continued here for the benefit of collectors and other enthusiasts who wish to make use of this service. It should be considered, unless specifically listed otherwise, that all material presented in this column is complete and in good condition. Correspondence regarding these items should be addressed to: The Trader's Corner, AERONAUTICA, Institute of the Aeronautical Sciences, Inc., 7660 Beverly Blvd., Los Angeles 36, Calif.

SELL—Accurate three-view drawings of Ford Trimotor as appear on page 8 this issue. Plans are ozalid reproductions in popular 1/72 scale (twice the size of AERONAUTICA three-view). Priced at only $0.50 each, postpaid.

WANT—Both volumes *The Lafayette Flying Corps*, by Nordhoff and Hall.

SWAP—Air race photographs.

WANT—*Zeitschrift für Flugtechnik und Motorluftschiffahrt*, 1908 through 1920.

WANT—*Aircraft Year Book*, 1931 through 1938.

Aerial Post

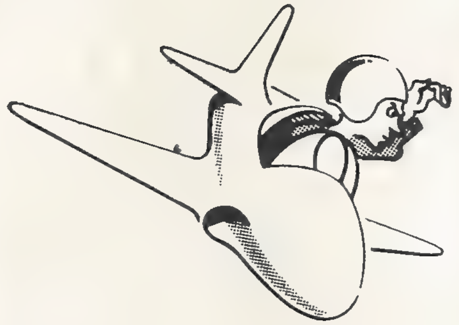
Dear Sir:

In answer to Mr. Walter Fitch's letter in the April–June, 1951, AERONAUTICA: "Yes, it is a Spad." This is one of the many airplanes of similar vintage in the collection of Paul Mantz Air Services, Burbank. Can it be presumed that there are other readers of AERONAUTICA who are sufficiently interested in the old aircraft as museum pieces and who would work to restore and preserve such items? Warren Aircraft, in England, is restoring several famous airplane types, and it seems to me that if this can be done abroad it can surely be done here.

Yours,
J. SLOAN

Reply

It appears to us that some wealthy enthusiasts are needed, like those who now collect historical automobiles, before Mr. Sloan's dreams will be realized. No museum, except the overcrowded Smithsonian, seems to be particularly interested in acquiring and preserving any comprehensive collection of historical aircraft. Apparently, the bones of a mastodon have influenced our civilization more than the airplane.—EDITOR.



LOST BY LOCKHEED

By P. A BECK

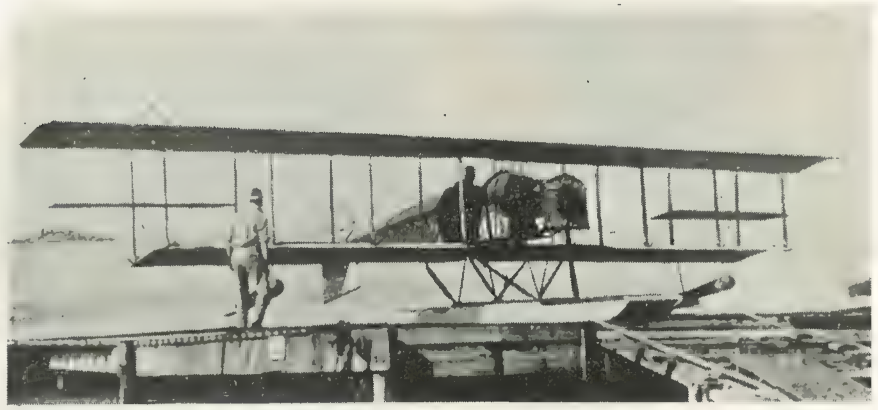
This year is an anniversary year at Lockheed. That company wants to know the present location of the early Lockheed airplanes pictured below and any other interesting information about them.

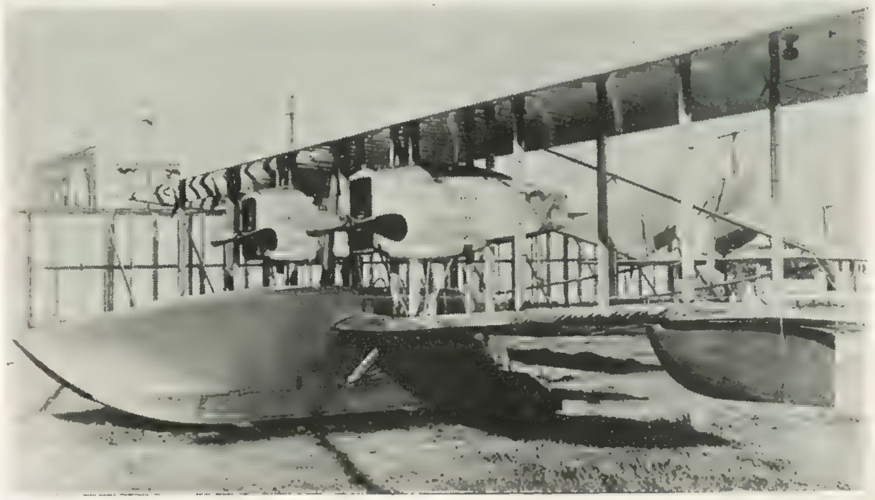
If you have any information about these airplanes, please write to: "LOST BY LOCKHEED," AERONAUTICA, 7660 Beverly Boulevard, Los Angeles 36, California.

G SEAPLANE

The first Lockheed, the three-place G Seaplane, first flew in 1912. With a wing area of 380 square feet and a Curtiss "O" liquid-cooled V-8 engine, rated at 78.5 hp., it cruised at 51 m.p.h. It was considered to be the first successful tractor seaplane in the United States. Note ailerons midway between wings.

Capitalizing on public interest in it, the G Seaplane flew hundreds of passengers around the San Francisco Bay Area during the Pan Pacific International Exposition of 1915. Only one was built.



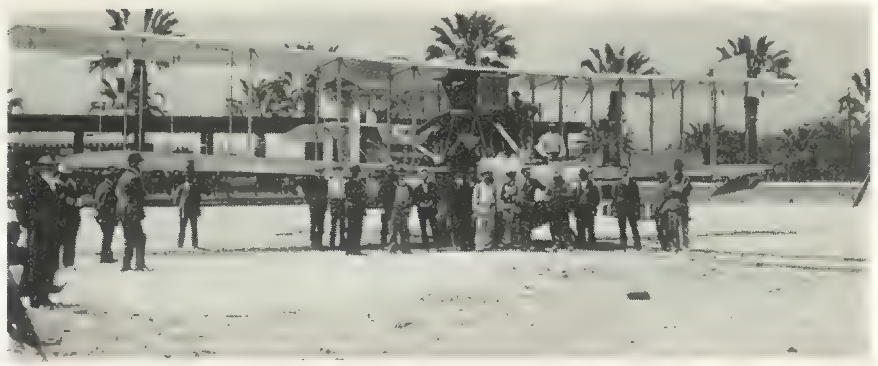


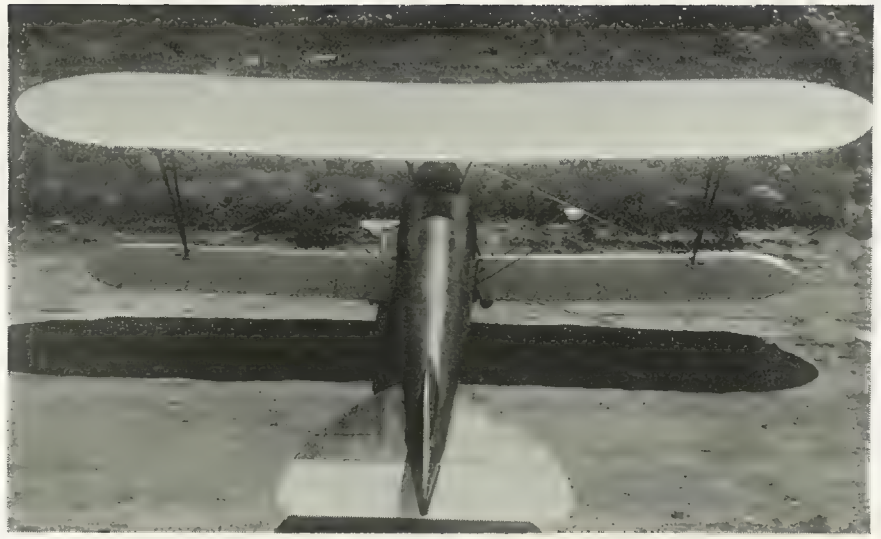
F-1 FLYING BOAT

The twin-engined F-1 Flying Boat first flew in 1916. It was believed to be the largest seaplane in the world at that time. The upper wing had a span of 74 feet; the lower wing, 48 feet. It was powered by two Hall-Scott engines, each developing 160 hp., and weighing 3.75 pounds per horsepower. Note metal outriggers running back to the three-surface tail. Last report of the F-1 was that it was fitted with wheels and redesigned F-1A for a transcontinental flight from the Pacific Coast to Washington in 1918 or 1919. It may have crashed. Naval analysis of the F-1 resulted in Lockheed being given contracts for two HS2L's.

HS2L

Only one H2SL was built, however. It was a 3PSB with the span of the upper wing the same as the F-1 (74 feet), but the lower span was increased by 14 feet. Powered by a Liberty 12 engine, with a rating of 330 hp. at 1,600 feet, it cruised at 78 m.p.h. Note gunner's cockpit in nose and the single rudder. The gross weight was 6,432 pounds, and the weight empty was 4,300 pounds.





S-1 SPORT

The S-1 Sport was Lockheed's first landplane. Of molded plywood, its fuselage represented the first successful use of monocoque construction.

The lower wing was rotatable and turnable for use as either aileron or air brake. The wings were also designed to fold for garage stowage. The 24-hp. engine was designed and built by Lockheed (or "Loughead," according to the original spelling).

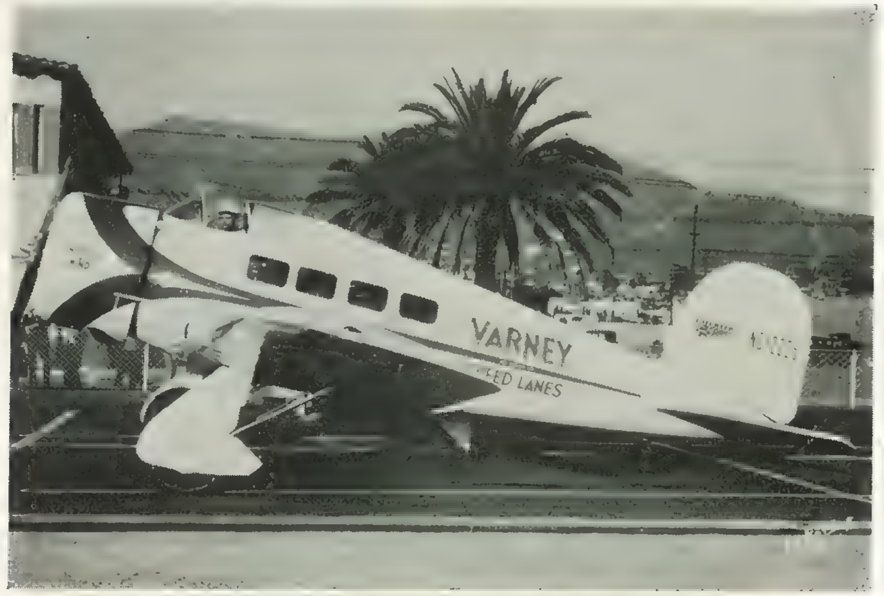
With a gross weight of 650 pounds, the S-1 Sport cruised at 68 m.p.h.

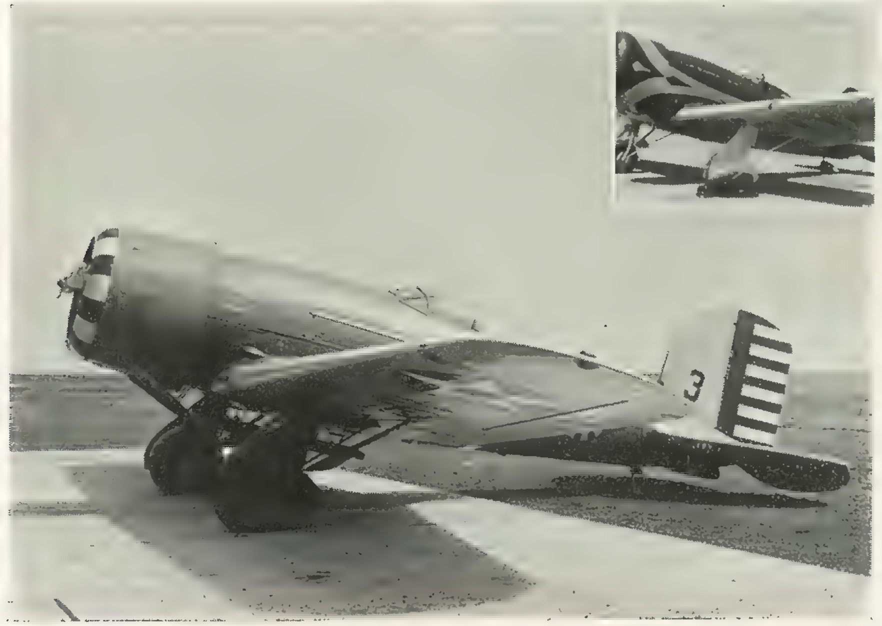
ORION

Speaking family-tree-wise, the Orion descended from the S-1 Sport through the Vega. Unlike the earlier airplanes shown here, more than one Orion was build—36 to be exact.

The first Orion was flown in December, 1930. It was then sold to Bowen Air Lines. Others were sold to T.W.A., Varney, Swissair, American Airways, Northwest, and other air lines, as well as to private purchasers. Varney's schedules with Orions from San Francisco to Los Angeles remained the fastest schedules until postwar equipment was introduced.

Where are these airplanes now?





ALTAIR

The most famous Altair, another of the Lockheed early low-wing group, was the "Lady Southern Cross," in which Sir Charles Kingsford Smith made the first west-to-east Pacific crossing. The "Lady Southern Cross" is shown as an insert. The larger picture is a Y1C23 Altair.

According to Lockheed records, one Altair crashed, one was lost at sea, two were sold to Okura & Co., two were sold to the Army, one went to the Navy for Laura Ingalls, one was Sir Charles', and one was later modified for a Unitwin engine. Where are they now?

Ace PHOTOGRAPHER

By W. B. AMES

"Movies are better than ever," say the Hollywood hucksters, but the Historical Associates who recently saw a series of old aviation pictures claim these particular old-timers are hard to beat. The films, from the collection of Elmer G. Dyer, A.S.C., were presented at a special meeting of the Los Angeles Section.

Representing a cross section of Dyer's many films, they featured historical airplanes and scenes from a number of aviation motion pictures. Highlights included action shots of a Horace Farman "Shorthorn," an SE-5, and a nimble Sopwith Triplane, all of World War I vintage but resurrected and flown during the 1937 Hendon Display. At the Hendon show, Dyer's telephoto lens followed the beautiful performance of a trio of Gloster Gauntlets as they did precision aerobatics in tight formation. Then came a pictorial review of the 1933 and 1936 National Air Races, with the camera trained on Harold Johnson and his stunting Ford Trimotor and other featured attractions of these air shows.

Other reels depicted aviation's progress in the years following the Kaiser War, with scenes of early mail and transport planes plus an interesting short made by Dyer (based upon fact) concerning the troubles of an air-mail pilot in the days of the open cockpit mail plane. In addition, there were scenes of actual Spads, Neuiports, SE-5's, and Fokker D-7's engaged in mock dogfights for the air-war movies of the early thirties. Of course, fake Fokkers in the form of the ubiquitous Travel Airs were also to be seen . . . "Wichita Fokkers," as Dyer said they were called by the famed stunt pilots who put them through their paces for Dyer's cameras.

Informal comments on the pictures were offered by Dyer, who, after taking aviation motion pictures for more than 30 years, is rightly recognized as the dean of aerial motion-picture photographers. Born in Kansas City, Dyer spent his early life in Texas and then California, where he entered the then-infant movie industry. It was in 1919 that he took his first aerial pictures, having entered the field strictly by accident.

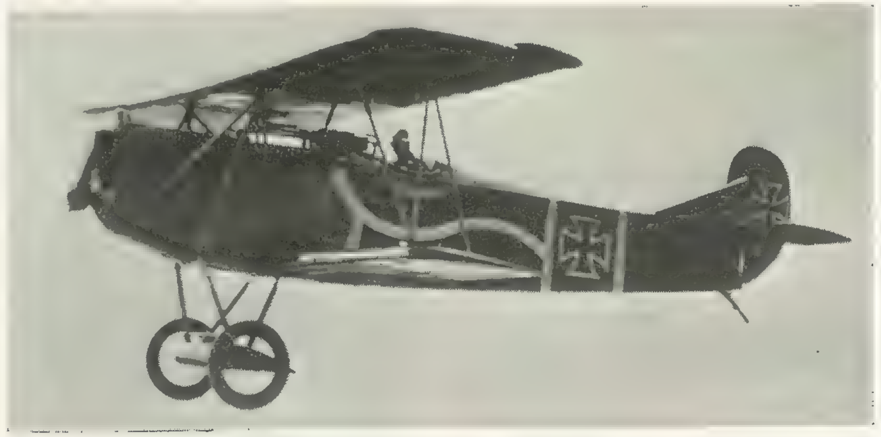
While working on the first aviation movie, *The Great Airmail Robbery*, Dyer had to pinch-hit for the regular camera man who got sick while making the necessary aerial shots. A combination of courage and camera skill made Dyer a natural for the job, and since then he has been behind the camera, shooting air scenes for such famed pictures as *Lilac Time*, *The Dawn Patrol*, *Hell Divers*, *Night Flight*, *Dirigible*, *West Point of the Air*, *Devil Dogs of the Air*, and, of course, the masterpiece of them all, *Hell's Angels*.

To obtain night effects of pictures taken during the day for scenes in *Night Flight*, he successfully introduced infrared film to aerial motion-picture work in 1933.

In the course of making over 60 aviation films and in flights made on his own as a licensed private pilot, Dyer has accumulated more than 10,000 flying hours to his credit.

As an Air Force Major in World War II, he served with the 8th Air Force in Europe and helped to train over 200 aerial photographers in this country.

Dyer has operated as a free-lance photographer for the past 15 years and at present is arranging his films for television presentation. Members of the Los Angeles Historical Branch have offered to aid him in this endeavor by identifying airplanes and assisting in other ways so that a long-needed series of documentary films on aviation history will be available.



A Fokker D-7 photographed by Elmer Dyer. Notice the Maltese cross, which movie directors considered more "German looking" than the correct Latin cross.

TIN GOOSE

BY R. J. CLARK

Excerpts from a paper presented on September 15, 1950, to the Historical Associates of the Los Angeles Section.

(Left) An unusual picture of a late 5AT with British markings. (Directly below) A 4AT photographed in October, 1951. It is still flying.

R. J. Clark

Robert J. Clark, whose address on the Ford Trimotor was the first of a series of historical briefs presented to the Historical Branch of the Los Angeles Section, has been interested in things aeronautical for more than 20 years. His interest is now centered on airplanes of the 1920–1930 era, of which he considers the Ford his favorite.

He received his Master of Science Degree from California Institute of Technology and at present is with North American Aviation, Inc., where he is Assistant Project Engineer on the FJ-2 Navy fighter.

In addition to being a charter member of the Los Angeles Section's Historical Branch, he has been an I.A.S. member for 10 years.

In many respects, the story of the famed Ford Trimotor closely parallels that of the most fabulous Ford product, the Model T. For, like the "T," the Trimotor appeared at a time when it was most needed, it more than served its purpose, and it too, in time, was passed by in favor of more advanced designs when mere modifications no longer kept it up to date.

The Trimotor did not represent Ford's only experience in aircraft manufacturing, but it overshadowed everything else he did in this field and had a profound influence on the story of American commercial aviation, despite the fact that it was a financial failure.

Henry Ford's first venture into things aeronautical occurred when the giant Ford enterprise, as part of its vast World War I military production program, built more than 5,000 Liberty aircraft engines. Immediately after the war, Ford eagerly returned to the Model T, and it was not until the early twenties that aviation captured his attention again.

Focal point for this interest in aviation was a plane built by the Stout Metal Airplane Company of Detroit to replace the wartime DH-4's on the Chicago–Cleveland air-mail run. Developed by designer William B. Stout, this plane bore the luxurious designation, Stout "Air Pullman." It was a single-engined, high-wing, cantilever monoplane powered by a 400-hp. Liberty engine. One of the first all-metal planes built in this country, it had an open cockpit and accommodations for seven passengers in a cabin that boasted of such refinements as a heating and ventilating system. The "Air Pullman" was the direct predecessor of the Ford Trimotor and as such was destined to become an important factor in Ford's later aviation endeavors.

The first active sign of the new Ford interest came in the development of the Ford Airport built at Dearborn, Mich. The airport was dedicated on January 15, 1925, and included a factor for the Stout organization, hangars, and paved runways. Three months after the airport was opened, on April 13, the second phase of the Ford aviation experiment was inaugurated with the formation of a Ford-owned air line, which began operations with Stouts.

A Ford 5AT-C used by the Shell Oil Company. This was a comparatively late type.

The success of the air line aroused Ford's enthusiasm and also brought out the need for bigger airplanes. To supply the necessary equipment, the time-tested Ford theory of "build it yourself" was advanced again, and on August 3, 1925, the Ford Motor Company became an active aircraft manufacturer by gaining control of the Stout Company. This new consolidation became the Stout Metal Airplane Company Division of the Ford Motor Company.

Production of the Liberty-engined "Air Pullman" continued, and in December the company revealed it had conceived a trimotored transport plane. This new model, the 3-AT, was to be an eight-passenger design with three Wright engines. Actually it represented a converted single-engined Stout. Initial flight tests were scheduled for June, 1926, but on January 17, a fire gutted the entire factory and the partially completed trimotor was destroyed.

Ford immediately announced that another trimotor, of improved design, would be built. Meanwhile, construction was started on a new factory that would be nearly three times as large as the original. The enlarged and modernized factory was finished in October, 1926.

Despite the setbacks caused by the fire, the first Ford trimotor to be completed was test-flown on June 11 by Major R. W. ("Shorty") Schroeder. Designated the 4-AT, this eleven-passenger model, with square wing tips and an open cockpit, was powered by three 300-hp, Wright J5 engines.

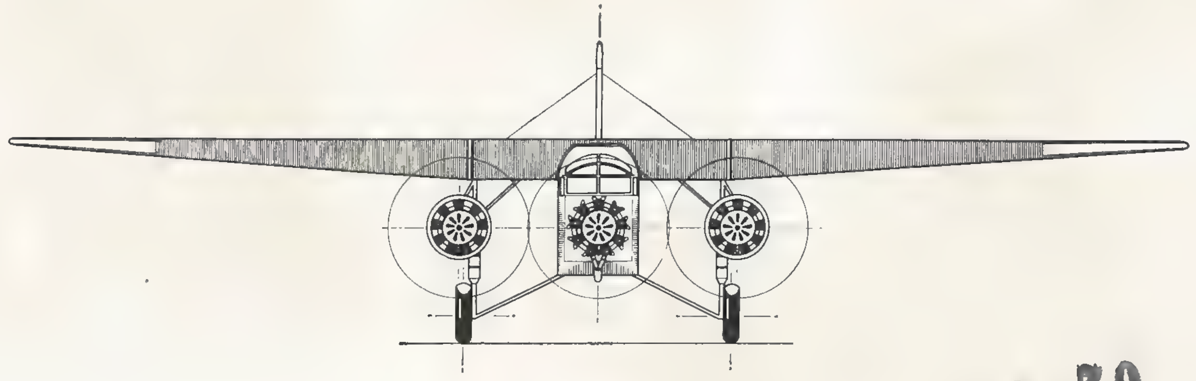
To publicize his new product, Ford in 1926 sponsored the first of several annual Airplane Reliability Tours. These tours were to demonstrate the reliability of air travel on a predetermined schedule. Ironically, Ford-built planes did not give a very good account of themselves in these events (although rival Fokker designs did), but the resultant publicity helped to give the struggling commercial aviation industry a much-needed source of public recognition and acceptance of scheduled air transport.

By the end of 1926, four of the 4-AT's had been completed, two of which went into service on the Ford air line. As the result of progressive manufacturing methods and the introduction of more detailed assembly jigs, production of the 4-AT during 1928 was increased from one plane a month to one plane a week.

In August of that year, another model, the 5-AT, was completed.

(*Concluded on p. 10*)

An early 4AT, with Wright engines, used by Blue Bird Air Transport, Inc.



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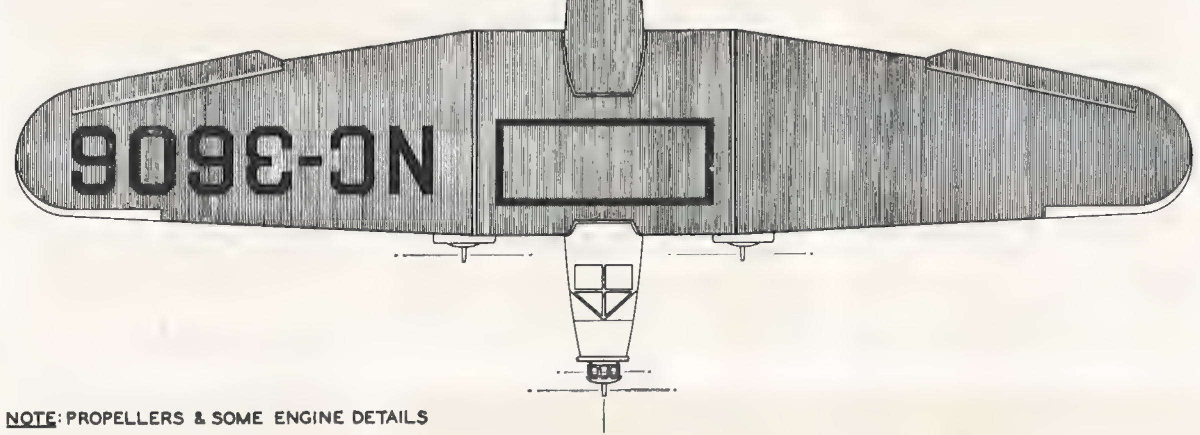
The Ford 8A cargo plane, with one Hisso engine.

The unsuccessful XB-906 Ford bomber of 1930.



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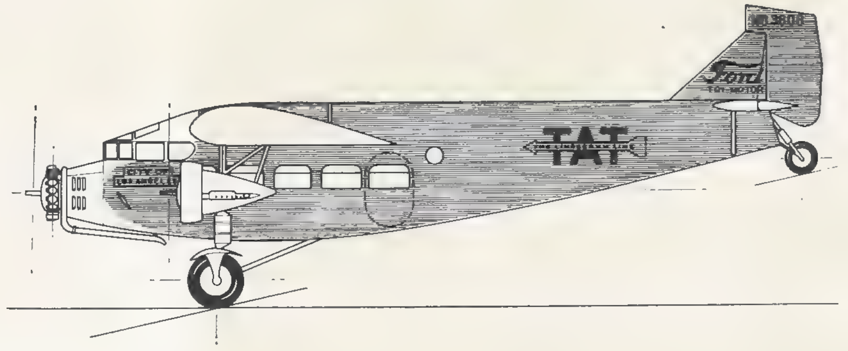

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SCALE

FORD 4-AT

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NEWS FROM HERE AND THERE

Steadily increasing numbers of guests at meetings and a gratifying number of applications for membership have been noted by the Historical Branch, Los Angeles Section. The Los Angeles Branch—first, and at present the only, organized group of Historical Associates—recognizes as contributing factors to this growth of interest in the preservation of aviation history: (1) the magnetism of a formal organization; (2) planning of interesting and informative programs with outstanding speakers; and (3) an extended mailing list of the *Wood'n Wire Bulletin* in which meetings are announced and other organizational news publicized.

Under the chairmanship of R. L. Bliss, the speakers and subjects to date have been: Elmer G. Dyer, A.S.C., "The Cameraman's Scrapbook"; Robert C. Hare, "Development of the Fokker D-7"; Eugene O. Clay, "Historic Highlights of Rigid Airships"; and Frank T. Courtney, "The Evolution of Transport Design." Preprints of these subjects are being prepared by the Branch.

New officers were recently elected by the Historical Associates of the Los Angeles Section. (*Left to right*) Harry Gann, Treasurer; Helen Kulp, Secretary; Bob Johnston, Executive Chairman; John Sloan, Outgoing Chairman. Not shown is Ed Stickle, new Executive Vice-Chairman.

Britain's 10-year struggle to establish scheduled air passenger service was described by Frank T. Courtney at the October 19 meeting of the Los Angeles Historical Associates. Air travel between London and Paris—for military men attending the Paris Peace Conference after World War I—opened the way for passenger service, Courtney said. Despite postwar international regulations and financial and other restrictions, scheduled flights began on August 25, 1919, and continued with regularity in a spreading radius for 10 years before similar service started in the United States.

As one of the world's early test pilots, plane designers, and military flyers, Courtney made outstanding contributions to the early civil aviation program. One of the most enthusiastic members of the Historical Associates, he was recently appointed Program Chairman for the Los Angeles Branch.

Fort Myer (*Continued from p. 1*) flew. For this they had been heaped with calumny by both the press and Congress, so it was natural that they were quite shy when it came to taking an interest in a flying machine.

Under pressure they invited Wilbur Wright to appear before them in December, 1907. His dignified and modest manner and his failure to make extravagant claims for their machine won the confidence of the Board. A set of specifications was drawn up, based on what Mr. Wright said they could do, bids were invited, and on February 10, 1908, a contract was signed with the Wrights.

Orville Wright arrived with the machine at Fort Myer on August 20, 1908, and by September 3 was ready for the official trials. Most of their experimental flights had been of only a few minutes' duration, so their total time in the air was not great. The September 3 flight was a series of ups and downs. In avoiding the small shed used as a hangar, he skidded on landing and broke a runner. It was not at all serious but the papers came out with glaring headlines: "Wright near death."

In a few days he acquired complete mastery of his machine, gradually increasing the length of time in the air until September 9, when he passed the hour mark. On landing, he approached Lt. Frank P. Lahm, who was in charge of operations for the Signal Corps, and to the lieutenant's surprise and delight, invited him to fly. It lasted only 6 min. and 24 sec., but it marked a world's record for a plane carrying two persons.

Lieutenant Thomas E. Selfridge decided early in his career that he wanted to be identified with aeronautics. He served as Secretary of the Aerial Experiment Association, organized by Alexander Graham Bell, inventor of the telephone. Glenn Curtiss was Director of Experiments. They worked successfully with man-bearing kites, gliders, and, finally, airplanes, the forerunner of the Curtiss Jenny of the World War I era. Selfridge was detailed by the War Department to aeronautical duty with the Signal Corps and was present at Fort Myer. On September 17, Orville Wright took him up for a flight. A new and longer propeller than the one he had been using fouled a guy wire of the tail assembly, causing the plane to dive and crash with a loud roar and in a cloud of dust. Lieutenant Selfridge died in the Fort Myer hospital that evening, the first of many who were to give up their lives that the airplane might serve mankind by reducing the size of the world many fold and by bringing nations into closer contact with each other.

The following year both Wrights came to Fort Myer with a new and faster machine than the one demolished the summer before. Orville Wright took Lieutenant Lahm for a flight of 1 hour and 12 min., another world's record. Lieutenant Foulois, later General Foulois, Chief of the Air Service, flew with Mr. Wright over a measured 5-mile course between Fort Myer and Alexandria. The Board recorded an average speed, over and back, of 42.582 m.p.h., which gave the Wrights a bonus of $5,000 added to the contract price of $25,000 for the 40-mile speed.

A field was prepared at College Park, Md., where Wilbur Wright completed the contract by teaching Lieutenants Lahm and Humphries (detailed from the Engineers) the operation of the machine. After approximately 3 hours of dual instruction, they were permitted to solo, after which they continued to practice to perfect their piloting technique. The elevator lever was operated by the pilot with his left hand, by the student with his right hand. The combined rudder and warping lever was between them—right-handed for the pilot, left-handed for the

Fort Myer *(Concluded from p. 9)* student. The two lieutenants trained each other in operating from the pilot's seat.

On November 3, a new "first" was recorded. Lieutenant Lahm took up his first passenger, Lt. George C. Sweet, the first Naval officer to fly in an airplane. He had been attached to the Signal Corps as an observer during the trials both years and was a member of the Board that investigated the Selfridge accident.

A description of this, the first military airplane, may cause you to raise your eyebrows when you compare it with the supersonic planes of today. It is on exhibition in the Smithsonian Institution in Washington, restored to its original state when presented by the War Department to that Institution after it had served its purpose as a stepping stone to newer and better military aircraft.

It is a biplane, 28 ft. long, 36 ft. 4 in. wide, constructed mostly of spruce and unvarnished cotton. The lifting area is 406 sq. ft., weight loaded with two passengers and fuel, about 1,200 lbs., giving a power loading of about 40 lbs. per hp. and wing loading of about 3 lbs. per sq.ft. A speed of 23 m.p.h. is required to rise. Flying speed is 44 m.p.h., with constant engine speed of 1,310 r.p.m. The 30–35-hp. engine has four vertical cylinders and no throttle or carburetor. To start it, waste saturated with gasoline is held over the air intake and is sucked into the cylinders when the propellers are turned over by hand. A foot pedal operated by the pilot advances the spark for maximum and constant speed. To land, the pilot lets go of one of the control levers and strikes a string stretched between two struts, thus releasing the compression and stopping the engine for a deadstick landing on the two long skids.

The only instrument is a tape attached to a crosspiece in front of the pilot. It indicates a slit or skid if it does not fly parallel to the line of flight. After landing, two wheels are placed under the two wings and the machine is wheeled back to the starting track.

To take off, the runners rest on a two-wheeled truck placed with its tandem wheels on a monorail 60 ft. long, oriented into the wind. A 1,500-lb. weight is raised by tackle to the top of a derrick and is then connected by a rope running to the outer end of the track and back to a hook on the leading edge of the plane. By tripping a trigger under his seat, the pilot releases the weight, which pulls the plane forward and, with the engine at full speed, gives the power required to rise by the time the end of the track is reached. As the pilot operates the elevator control, the plane rises and the track remains behind.

Even in 1908 the Wrights faced a skeptical and unbelieving world. The *Scientific American* had written of "The Wright Aeroplane and its Fabled Performances," of their "alleged" flights. After centuries of unsuccessful attempts, it was more than the public could grasp when told that two young and obscure Americans had solved the problem of flight, had conquered the air.

But Fort Myer forced conviction, and then enthusiasm rose to greater heights than had ever been attained by the comments of the doubting Thomases.

Fame and fortune came to the inventors but did not in the least change their modesty, their unassuming manners, their sincerity, or their loyalty to their friends.

43 70

Tin Goose *(Concluded from p. 7)* Slightly larger than the 4-AT, it offered accommodations for 14 passengers and was powered by three 410-hp. Pratt and Whitney Wasps. Seventeen of these were built in 1928.

Trimotor output totaled 57 units in 1928, of which 54 were sold in varying lots to the then budding air transport services including National Air Transport, Maddux, Colonial Air Transport, Stout Air Lines, Northwest, and Transcontinental Air Transport. The latter started operations in May, 1928, with ten Fords.

That same year saw additional expansion of plant space and personnel, and accordingly production rose to three planes per week, with ultimate facilities for one per day. This schedule was aided by the adoption of a "ten-unit" plan wherein each plane in a block of ten was identical to others in the same block. The third Trimotor variation, the 6-AT, appeared on May 25. Having the same dimensions as the Wasp-powered 5-AT, this model was equipped with Wright Whirlwind engines.

From the original 4-AT, the evolution of the Ford Trimotors through the 6-AT design consisted mainly of progressively cleaner airplanes incorporating such changes and additions as: Frise-type ailerons, rounded wing tips, better passenger facilities, improved cockpits, landing lights, retractable mail compartments in the wings, and "speed lines" in the form of ring cowlings for the outboard engines and wheel pants to replace the earlier mudguards. Although the basic design configuration remained unchanged, variations to the three models appeared, accounting for such designations as 4-AT-E and 6-AT-D. In addition to the conventional wheel landing gear, Fords were fitted with twin floats and were also provided with skis for specific operations. A ski-equipped Ford of the 1929 Byrd Antarctic Expedition was the first airplane to fly over the South Pole. Many were used by large oil and manufacturing corporations, and a few were fitted with luxurious interior appointments to serve as flying club cars for wealthy private owners. Both the 4-AT and 5-AT models were sold in small numbers to the Army Air Corps as C-3 and C-4 Series, respectively. Others served as Marine transports. Ford's only other military venture was the half-hearted development of a trimotor bomber bearing a close family resemblance to the commercial transports. This plane crashed on a test flight in November, 1930, killing the crew of two, and Ford never again entered planes in military design competitions.

By 1930 the Ford Trimotor enjoyed an almost complete monopoly of the air transport business. It sold for approximately $50,000, a price that was much less than that of most comparable transports, and it had built up an enviable operational record. However, the design of the Ford had remained relatively static, and other manufacturers answered the air lines' call for faster and more modern equipment. Ford made a feeble attempt to remedy the situation in 1931 by bringing out a combination mail and cargo plane, the 8A, which appeared to be a single-engined model of the trimotor, powered by a geared Hispano-Suiza 725 engine. In the passenger transport field, he introduced the 14A in 1932. This 36-place giant had a span of 110 ft. and was powered by three Hispano-Suiza engines, one buried in each wing root, the third in a nacelle that was mounted above the cabin. Neither went into production, and by 1932 the Airplane Division of the Ford Motor Company ceased to exist.

Approximately 195 Trimotors had been built when production halted. Those in air-line service were gradually replaced by the larger and faster Boeing 247's and Douglas DC-2's during the early thirties and were bought by mining and export companies, feeder lines, and charter operators. The load-carrying abilities and rugged construction of the Fords paid off in the back countries of Canada, Mexico, and in South and Central America. The amazing and often unbelievable duties performed in these areas by aging Fords are legend. As late as 1944, 90 Trimotors were still in operation in various parts of Latin America; some are even in operation in this country today, 25 years after the prototype first flew.

As long as these airplanes continue to perform their assigned tasks, the story of the Ford Trimotor, the grand old "Tin Goose" that made service a byword to the early air transport lines, cannot be truly finished.

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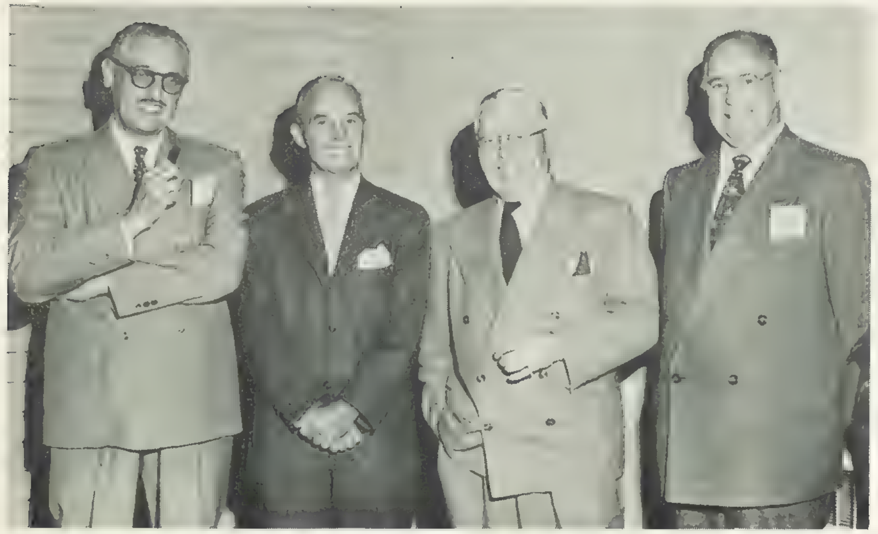
Loening speaks at L.A. meeting



On July 22, last, Grover C. Loening addressed a joint dinner meeting of the Los Angeles Section, I.A.S., and the Historical Branch. Above, L. to R., are Frank T. Courtney, who introduced Mr. Loening, second from left. Other distinguished guests present were Comdr. George O. Noville, of Byrd Trans-Atlantic Flight fame, and Vance Breese, well known test pilot.

LESSONS OF AIR HISTORY

BY GROVER C. LOENING

History repeats itself in aviation just as everywhere else. However, in our rush to meet a deadline, we are more apt to brush by the lessons of history or even to give up heeding them. As a result we burden our aviation development with needless added expense and wasted effort, duplication of research, and the devising of something that was tried years ago and proven unsatisfactory. Failing to find solutions for troubles encountered is often the result of failure to look back far enough to see what fix was already found by someone else years previously.

To tackle this subject adequately requires a great deal more than one short article. But it might help, and also be entertaining, to go through albums of old photographs and pick out at random various subjects that would be applicable to our thinking today.

(Continued on Page 5)

Grover Loening

Grover Loening is one of the most distinguished links between the historic past and the vital present of American aviation. In 1914 he became the first aeronautical engineer of the Aviation Section of the Army Signal Corps. During World War I he assisted the national effort on the Aircraft Production Board and the NACA Engineering Committee.

Between wars he founded the Loening Aeronautical Engineering Company, whose series of Loening Amphibians rendered famous civil and military services in days when airports were few, and he became the first president of the Aeronautical Chamber of Commerce. His advisory services during World War II won him the Wright Brothers Memorial Trophy and he continues to hold many consulting appointments where his long experience contributes to our national air effort.

AERONAUTICA
Official Publication for Historical Associates

CONTENTS

Volume 4 Number 2

FEATURES

Lessons of Air History, by Grover C. Loening................1
D-VII Development, by Robert C. Hare.......................3
Crossed Up..4
Photo by R. R. Martin......................................5

DEPARTMENTS

Editorial..
Trader's Column...
Aerial Post..
Courtney's Corner..

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EDITORIAL

With the change in staff announced in the last issue, the reader may question whether there will be a change in editorial policy and make-up. It would be difficult to improve upon the excellent job that was done by the National Headquarters who previously published AERONAUTICA. However as a guide to the new policy we list below the aims of AERONAUTICA:

1. To foster public interest in the history of aviation through the collection and dissemination of recorded aeronautical history.
2. To serve the Historical Associates of the I. A. S. by publishing material of varied fields of interest, pro-rated on the indications of how such interests are represented in the national membership.
3. To publish such material in presentable form, and in increasing quantities by resorting to such economies of publication as will best allow this.

This issue is an example of the initiation of that policy.

In recent months we have noted a renewed interest in aviation events of the pre-World War days, topped by 25th Anniversary issues commemorating Lindbergh's flight across the Atlantic, of several major magazines. It is gratifying to see this, particularly for the fact that a large number of people are still living who had a great part in the founding of the science of aviation.

The eye-witness accounts of pioneer aviators such as Grover Loening and Frank Courtney are valuable in implementing the stated purposes of this journal, and we are especially fortunate to be able to bring to you their observations. Courtney's remarks will be a regular feature of each issue.

PHOTO CREDITS

Page 1: A. U. Schmidt. Page 3: W. M. Bodie. Page 5: R. R. Martin.
Page 6: (above) Boeing Aircraft Co., (below) R. R. Martin

TRADING POST

Collectors of things aeronautical and other aviation fans are again invited to come into the Trader's Corner and avail themselves of this FREE Aeronautica service.

FOR SALE - Copies of "L' Aviazione Austro - Ungarica Sulla Fronte Italiana, 1915-18" by Ricardo Cavigioli and bound issues of 1917 "Flugsport". WANTED - "Illustrieste Flugwache, 1919". Peter M. Grosz, Rosedale Road, R. D. 2, Princeton, N. J.

WANTED - Copies of the "DeHavilland Gazette".

WANTED - Photos and accurate 3-view drawings of Platt-LePage XR-1 helicopter.

WANTED - To buy, or trade for, photographs of the Japanese "Shushi" (Me 163B) or the Heinkel 178. Would also like to have authentic 3-view drawings of the Curtiss P-60, XP-62, XP-87 and Heinkel 178. I have a large number of Luftwaffe photos for the interested trader. Ed Maloney, 203 S. Mills Ave., Claremont, Calif.

The Baker Library of the Harvard Graduate School of Business Administration would like to obtain operating manuals for the Fokker F-14, Fokker F-32, Stinson Model A, and Model B transports to add to their collection. In return, the library offers to trade their duplicate annual reports of aircraft and airline companies. In this regard, they desire to work with any library on an exchange of such reports. Interested parties should contact Ruth S. King, at the Baker Library in Cambridge, Mass.

WANTED - "All the World's Aircraft", 1918 to date. Will buy outright or will trade original photographs of old and new military aircraft from large collection. Jack D. Canary, 725 Via de la Paz, Pacific Palisades, Calif.

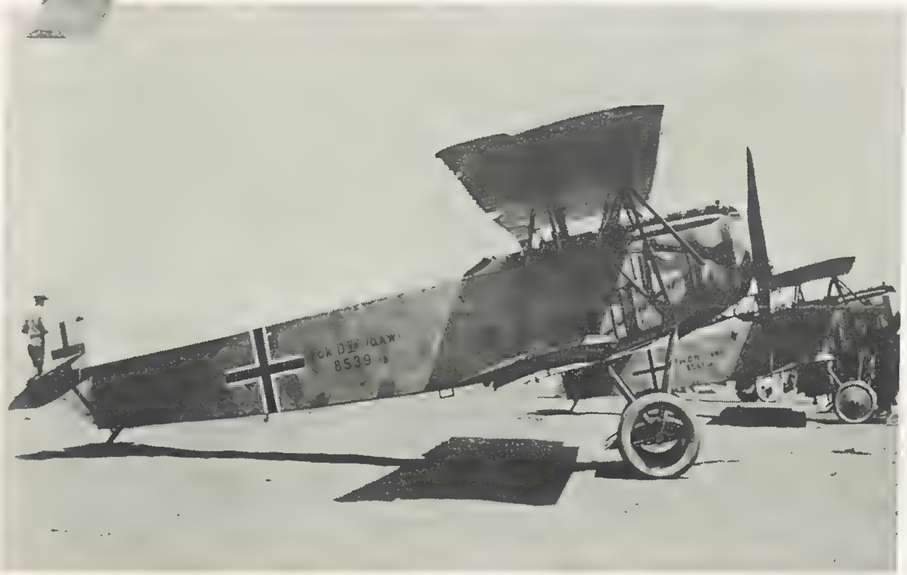
AERIAL POST

Dear Sirs,
Read Aeronautica Thought it was wonderful. Only one gripe; the German cross on the Fokker D.VII is the Cross Formee', not Maltese, and the Latin Cross referred to is correctly called the Greek Cross. Otherwise a swell job. Congratulations to the staff.
Sincerely,
Peter M. Grosz

NOTE - See article on Page 4 re: CROSSES. Ed. -----------

D-7 DEVELOPMENT

BY ROBERT C. HARE



Some of the lesser known details by "Mr. D-VII" himself

Of all of the airplanes produced by the belligerent powers during World War I, no one type has been accorded so much prominence in fact and fiction as the German Fokker D-VII biplane. To most persons interested in historical aircraft it is almost a myth. Its life at the Front was short; May to November, 1918. Yet the D-VII established one of the most remarkable records in fact, as well as in fiction, of any airplane ever built.

Its success was both actual and psychological. The D-VII represented a combination of aerodynamic elements that were completely contrary to accepted standards. Insofar as design was concerned, a ship like the D-VII was the last thing any of the Allies would have thought of producing. Take first the all-steel tube fuselage. That was a method of construction that amazed the French and British. To them, wood was the only thing. And the wings of the D-VII; not only were the Allies of the thin-wing school (the D-VII had unusually thick wings), but the wooden construction seemed to be an inconsistency with the metal fuselage.

The Fokker thick wing permited bracing internally, eliminating the drag caused by externally arranged struts and wires. While the Allies accepted the idea of eliminating parasitic resistance through internal bracing, they rejected it in their own designs because of the assumed inefficiency of the thick wing.

The steel tube fuselage and the thick wing caused much comment among Allied engineers. A third element, performance, seemed to violate all the practical theories from their standpoint. The D-VII, the French and British thought, could not possibly exhibit the excellent characteristics in the air that it did. But there it was, flying and fighting with the best the Allies could put in the air.

It is said that the Fokker D-VII made good pilots out of mediocre ones. There may have been a grain of truth in that statement. The point was, however, that the D-VII itself was capable of doing things certain Allied airplanes could do, but only in the hands of the most skilled flyers. For example, it had an inherently high stalling angle, enabling it to literally hang on its propeller. Any pilot in the German air service could do it, but to hang an S. E. 5 or a Spad on its prop for any length of time required the consummate skill of an expert.

The Fokker D-VII performed very well at high altitudes. It did not slip appreciably even at 20, 000 feet where again only the most skilled Allied pilots could keep their S. E. 5's and Spads from dropping off. Actually, a good D-VII could be looped from level flight at 20, 000 feet.

While Allied nations realized the importance of maneuverability, they seemed to put more stock in the importance of speed for their fighter planes. Here again Fokker was at crosspoints with Allied conceptions. The D-VII was a slow airplane...15 to 20 miles slower than many others it met in combat. Where many Spads hit 140 mph, a good D-VII pilot could only hope for 125 mph at best.

On the surface, then, the Fokker D-VII was a paradox in fighter design. The Allies could not understand why the great Fokker would turn out such a ship any more than they could fathom the reasons why the German air service would make it their standard 1918 pursuit. Today, some thirty-odd years later, all we can say is that you cannot deny success, and the Fokker D-VII was definitely a successful fighter plane. (Continued on Page 4.)

(Continued from Page 3.)

Perhaps the success of the Fokker D-VII can be attributed to the fact that Anthony Fokker had a free hand in designing the type of plane he thought would be the best of its kind. Unlike many designers of the WWI period, Fokker was a skilled pilot, and by talking to German aces with whom he had made friends, was able to crystallize the needs of those aces into one "super" ship. Because he was a strange combination of theorist and practical mechanic, he was able to separate the wheat from the chaff, aeronautically speaking, and come up with more of a flying gun mount than the accepted idea of an airplane.

Fokker's practical flair became apparent in his earliest monoplane. While all the other pilot-designers spent countless hours re-aligning their wood-and-wire fuselages, Fokker was flying. His steel tube construction needed no adjustments in service. It not only had fewer parts and was easier to build in a simple jig, but also it could stand the method of transportation adopted by the German Army. That was to strap the tail of the fuselage to the bed of a truck along with the wings and let the landing wheels run on the ground.

Early experience with his Eindecker types in combat proved to Fokker's satisfaction that the wire-braced monoplane was impractical for fighting. Wing failures were frequent. Those versions in the Doppledecker class were only a little better. There was too much structure of major importance that could be damaged by gunfire, and lead to the collapse of the entire structure.

Thus the Fokker "thick wing" came into being. He theorized that by putting all the bracing inside the wing, the resulting deep spars could take numerous hits without failure. Experience with the Fokker triplane later proved him correct.

Following the triplane he got down to business, designed an experimental model, the V.11, the granddaddy of the D-VII. It had cantilever wings of constant chord but varying thickness, the steel tube fuselage with simple, flat sides, and a small airfoil over the axle between the landing wheels. The V.11 was fitted with balanced control surfaces.

This airplane was actually dangerous to fly since it was oversensitive in all axes. By reducing aileron area, lengthening the fuselage and increasing vertical fin area, Fokker was able to make the V.11 into a usable airplane. Entered in open competition with the designs of other manufacturers early in 1918, the V.11 won hands down on all counts but speed, and became the Fokker D-VII.

In its production form, the D-VII first appeared in May, 1918, fitted with the Daimler D.III 160 hp engine, commonly called the Mercedes. Later versions were powered by the D. IIIa of 180 hp, and the B. M. W. of the same rating. Later B. M. W. engines were rated at 185 hp. These were six-cylinder in-line engines, water-cooled, and turned over at 1400 to 1500 rpm.

Actual dimensions of all WWI airplanes varied one way or another, even in production lots and the D-VII was no exception. Airplane No. 2075 might have been as much as an inch longer or shorter than No. 2076. Below are dimensions of D-VII No. 2455/18:

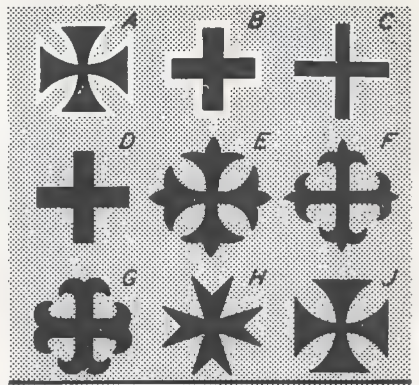
Span, upper		29' 3-1/2"
Chord,	upper	5' 2-1/2"
	lower	3' 11-1/4"
Length over-all		22' 11-1/2"

Where the Allies may have questioned the design aspects of the D-VII, they certainly gained respect for it, and demanded surrender of some 1700 D-VII's in flying condition at the time of the Armistice. It was the only airplane specifically mentioned in the Armistice terms.

Because of their unusual characteristics, planes of the D-VII type were used by minor foreign powers for many years following World War I. These were principally completed and partially completed D-VII's smuggled into Holland by Fokker following Nov. 11, 1918. Even today a few D-VII's are left, in museums and in private collections.

As a contributing factor in the progress of aviation, the Fokker D-VII is important on at least two counts. First, it established a pattern of cantilever wing, and steel tube fuselage, construction which became standard; and second, it resulted in Anthony Fokker's coming to the United States to contribute to our aviation progress some of his genius.

CROSSED UP



A. EARLY GERMAN INSIGNE
B,C. LATE GERMAN INSIGNIA
D. PLAIN CROSS ("GREEK")*
E,F. CROSS PATÉE (2 FORMS)
G. MILL-RIND ("MOLINE")*
H. "MALTESE" CROSS*
J. CROSS FORMÉE
*QUESTIONABLE OR NON-HERALDIC TERMS.

Mr. Grosz's letter (See Aerial Post) touched off an inquiry which could have been a Frankenstein's monster. However, since Aeronautica is an aviation publication, we can be content with a relatively superficial study of the subject.

During the first World War, it soon became evident that the use of a national insignia on aircraft would be a great help in recognizing friend or foe. All of the belligerents shortly adopted the custom, which is universal today (although its value in the sonic jet age is open to question).

It was only natural that, when the various countries realized the need for such an emblem, they adopted devices based on their national flags, or at least colors of the same. Thus Germany took for its insigne the white-bordered black cross displayed on the imperial standard.

Probably the first error in nomenclature was the very common term, "iron cross". This, of course, was made popular by the well-known German military decoration, and can be dismissed as a mistake of obvious cause.

Not so easily rejected, though, is the description, "Maltese Cross". While incorrect technically, the expression is almost universally applied to the type of cross in question and most any aviation enthusiast will form a mental image of the old German insigne when thinking of "Maltese Cross". For this reason, the term was used in a picture caption in the last issue of AERONAUTICA though we knew it to be wrong at the time.

(Continued on Page 8.)

PHOTO BY R.R. MARTIN

The above credit line was to be seen under airplane pictures published in aviation magazines for almost two decades, 1930 to 1949. Despite little actual contact with the aviation industry or experience with flying, Raymond R. Martin, commercial photographer and laboratory technician, had a fine eye for the historically interesting photo. His collection numbered about 1000 negatives including some excellent and very typical "shots" of Allied and Central Powers aircraft, postwar commercial and military types, and racers, which he printed and sold to correspondents throughout the U. S.

Ray Martin was born in Oakland City, Indiana in 1893. He learned commercial photography and established his own studio in Akron, Ohio, later went to California and set up shop there.

It is not known exactly how Mr. Martin became interested in airplane photography; his collecting began in 1929 as a hobby. Later, during the 1930's and 40's he sold 8 x 10 matte' prints by the hundreds. It is dubious that he made any considerable sums from his labors, but it was rewarding in another sense, that of seeing his credit line under the reproduction of one of his prints.

Mr. Martin died in 1949. His collection of negatives has been loaned to the Los Angeles Historical Branch by his widow, Mrs. Grace Martin. These have been carefully catalogued and preserved for the use of researchers into aeronautical history and, most important, are to retain their identity as "The R.R. Martin Collection." Arrangements are being made to continue the sale of prints on a royalty basis.

LOENING

(Continued from Page 1.)

Let us first delve into a few historical items. We are all familiar with the original Wright plane of 1903. But excellent photographs, seldom published show the 1904-05 biplane which was flown repeatedly at a field near Dayton. Farmers in the vicinity, too familiar, gave little heed to the history being made there, and to engineers who passed by and saw the famous Model B in the making, it was merely those nutty Wright boys and their useless boxkite.

These pictures also show the prone position of the pilot which now, almost fifty years later, is coming back into our concepts for two reasons; the desire to provide the pilot with a position that will take more G-loads, and as a feature of the vertically rising aircraft that turns ninety degrees to fly horizontally. The lesson to learn here may be a negative one; why almost fifty years ago this position was given up for good reasons. Simply that the pilot would have to lie on top of all his instruments, would be most uncomfortable reading a map, and would have difficulty looking above and behind. Can you drive a car lying down?

The first really public appearance of the early pioneers was at the Hudson Fulton celebration in New York City in 1909. This, incidentally, was the occasion of my own first acquaintance with aircraft and with Wilbur Wright when I was a student at Columbia University. Knowing that much of their flying would be over water around the rivers of New York, both Wright and his rival, Curtiss, put elementary flotation into their aircraft. Wilbur carried a canoe (covered over), with a volume barely enough to float the entire machine, but the rubbercloth wings would have helped greatly. Curtiss had even less volume and his wings would not have helped at all, since they were single-surfaced. Neither of them had taken into account the added directional instability that these items embodied. Mr. Wright in particular complained about it.

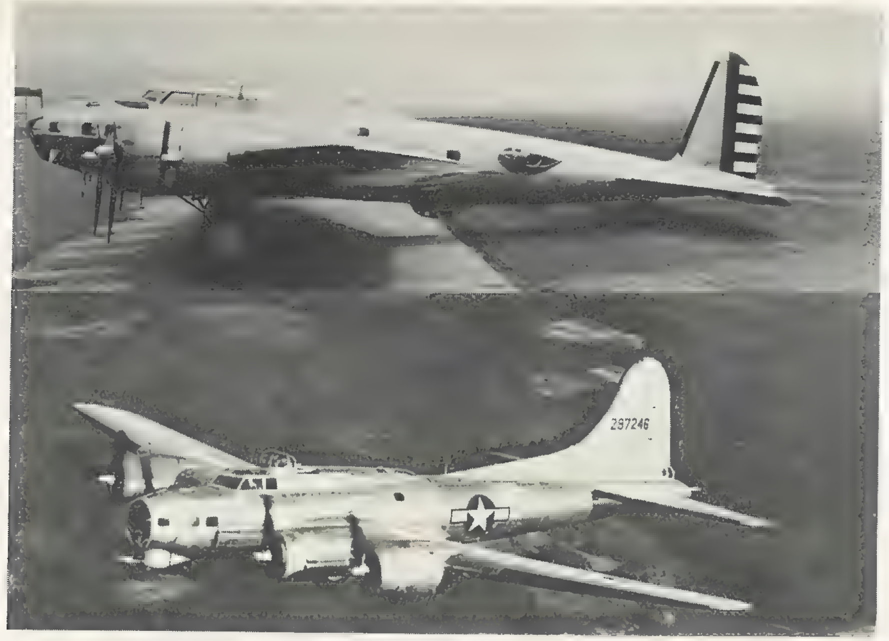
This was one of the earliest lessons. Don't add any fin area forward of the center of gravity without thorough consideration. This goes for some of the troubles encountered in blind flying late model aircraft equipped with external stores that have fin area effect.

One of the successful pioneering airplanes in France was the 1911 Henri Farman. Curiously enough it was chiefly in France that this "pusher" concept of aircraft was abandoned far more quickly than it was in this country. Starting with his cross-channel flier of 1909 Louis Bleriot called the turn unmistakably with his "tractor" type of aircraft. From 1910 on, his Bleriot XI was by far the outstanding plane of its day and in this country it gave the Wright exhibition planes a severe run for their money. The lesson to learn here is not to underestimate what can be developed in Europe, despite what we fancy is our leadership in design. The DeHavilland Jet Comet is today as much a leader as Bleriot was forty years ago.

The years roll on and in the late 1920's we find the famous and very successful German designer, Dornier, coming up with two extremes in design. One was his simple "Komet" which had quite a little usage and many interesting features like the cantilever landing gear. But from the same office came what is without doubt one of the weirdest and most ridiculous huge aircraft ever made, the DO-X. From a design standpoint, this whole layout with its twelve engines was an installation nightmare of the first magnitude. Even with its twelve engines it barely crossed the ocean. It

(Continued on Page 6.)

The DORNIER DO-X



What happens to tail fin areas! The B-17B of 1939, above, and the final production version, the B-17G, below.

(Continued from Page 5.)

failed to put into practice the principle "raison d'tre" of flying, namely, speed through the air with the least power --- hardly obtainable by sticking everything out in the open.

In 1930 we come to an epic item in the history of aviation, the Guggenheim Safe Airplane Competition. Among the 27 entries, two, the Curtiss "Tanager" and the Handley-Page, were outstanding in teaching how important slots and flaps were in extending the speed range of airplanes. Today, when we are slot happy and flap crazy, how many of us stop to ponder the fact that these features lay dormant for almost ten years before designers gave them serious consideration. I could go on to many other instances of this kind. Wheel brakes, variable pitch propellers, trim tabs, servo balances, retractable landing gears, and so on down the list, were all dismissed originally as needless complications and added expense.

Little does the designer today realize, when the monoplane is the universally accepted configuration, that only thirty years ago it was considered structurally dangerous, unstable, tricky and highly undesirable. It was so unpopular that I am personally reminded of an early air show at which one of my monoplanes was exhibited. An intelligent looking engineering fellow came up to me and said, "I beg your pardon, is this a monoplane or an aeroplane?"

Now let us go into some more detailed lessons. When I look into the cockpit of a present day aircraft, I know where the main controls are, surely enough. But because each model is so different from another in other details, I cannot place my fingers readily on the trim tab, landing gear or flap control levers, I am reminded that in this regard we are just about where we were in the early days on the standardization of control mechanisms.

43 70

Even the original Wright airplane controls were not standardized. Wilbur had one type and Orville another. And as they never could agree on anything excepting the inspired design of their airplane, they concentrated their differences in the controls. Wilbur insisted on having the elevator lever on the left hand and two forward moving levers on the right hand, one of which operated wing warp, and the other the rudder. Orville devised a gimmick of his own for the right hand lever in which a hinged handle at the top of the lever, moving sideways, controlled the rudder and fore and aft movement controlled the warping. Their feet, of course, were busy with the throttles and they had no concept of a foot bar for the rudder.

Ruth Law, famous early aviatrix, at the Wright controls of her Curtiss Racer.

It was very difficult for aviators to pass from one control system to the other. That is why the album shows a picture of Ruth Law with Orville Wright's type of control mounted on a Curtiss plane. Miss Law had purchased a Curtiss, but had learned to fly with the Wrights. Even the Army's original tractor types had to have the Curtiss control as in the Martin Type 38 and yet to add to the confusion, the Burgess Tractor had Wright lever controls until it was later modified by the Army engineering department at San Diego. Then it had Curtiss control in the front seat and the novel-to-Americans "DEP" control in the rear seat. Contemplating these early days, there should be more standardization of all controls on aircraft, even minor ones.

We now come to another subject, namely tail fin area and its disposition. We need only to look at a few early land- and seaplanes of 1916 vintage to show the thought, of that time, that very little fin area and an unbalanced rudder of long chord was the pattern. What happens to fin areas is very well shown by comparing the famous B-17 of 1939 and then looking at the final B-17G which was the last production model of this most noteworthy aircraft. Through the years fins and rudders have gone even larger and larger and higher and higher! Looking at the RY-3 of 1946, one wonders how far we can go. As far as this author knows, there has never been an instance where high fin and rudder areas were reduced, excepting for a structural flutter or armament reason.

In the early 1920's it still was not generally known why some aircraft were very stiff in their lateral controls. When the Loening developments in monoplanes got going, we soon learned (and were among the first to learn), the effect that a trailing edge

(Continued on Page 7.)

(Continued from Page 6.)

aileron had in twisting the wing so as to reduce the incidence of the side we were trying to lift, with the net result that all one had on his hands was a heavy air pressure on the aileron and no corresponding movement of the airplane. To meet this problem, we first reduced the size of the aileron and centered it nearer to the strut bracing point. This helped the control considerably. But the final test was an experiment that may provide many lessons today as to control difficulties.

We proved out the wing twist effect by mounting a small aileron on the front spar of one of our "Air Yachts", leaving the original aileron as it was and arranging the controls so that the pilot could use them either singly or together. We discovered that the tiny aileron we put on the front spar was ample for lateral control. In fact it was a little too sensitive because it twisted the wing to give added lift on the side we were trying to lift. On the extremely thin wings and large fins that high speed aircraft require today, these lessons could apply quite pointedly.

Within the space limits of this presentation, it is impossible to cover the subject of the ridiculous limitations that government specifications have placed on aircraft developments, but I am going to cite one instance. Specification 100A of the Navy Department was the guiding control for the building of Naval aircraft in the early 1920's. There was one paragraph that stated, in effect: "Aluminum shall not be used in any structurally stressed or vital part of an aircraft."

At about that time, in airplanes we were building for the Navy, the gas tanks were made of ternplate of very thin gauge with numerous reinforcing bulkheads riveted to the outer skin, and all joints soldered. We were using the 300 H. P. Hispano Engine, (a fine engine but it vibrated unmercifully due to an eight cylinder harmonic) and as a result the ternplate tanks were leaking badly. We decided, in desperation to give up this unsatisfactory way of building tanks and went to a tank of 1/8" aluminum sheet with welded joints, no rivets, no bulkheads and, incidentally, no leaks.

This tank was not only safer and cheaper to build, and leakproof, but it was also lighter. However, due to Spec. 100A, the Navy Department refused to accept this modification in design, and we refused to build any more airplanes with ternplate tanks in them, all of which practically constituted a strike against the customer. Finally we arrived at a compromise; we would build and install aluminum tanks, guaranteeing the Navy for one year against leaks, during which time part of the payment for the aircraft was withheld.

Now in the industry there are many such instances, and the trouble is simply this; the customers and the Services are all wrong in citing any detail specifications for new aircraft. Part of the development of new aircraft that should be eagerly looked forward to by the government and others is to have an advancing change in detail specifications as part of progress.

We now come to design salesmanship. One of the greatest limitations on designing new and advanced aircraft, or anything else, is to sell it to a customer who isn't used to it. In the development of the Loening Amphibian there is a lesson which designers might well ponder. We were introducing a very novel type of aircraft to the Army and Navy which, at that time, they did not particularly want. My earlier designs had been only modestly successful, and I had reasoned that they were too novel, particularly in bucking the prejudice against monoplanes. The acceptance of our amphibian design was absolutely essential to the further progress of our company. And so, as a design feature, consideration was given to what we could do, from the selling angle, to make the airplane quickly acceptable. We arrived at this solution; since it was in competition with a DeH landplane and was using the Liberty engine (although inverted), why not have the wings somewhat the same? We deliberately laid out the wings to have the same chord, gap, and stagger as the DeH and placed the cockpit in our design so that the pilot's eye was in the same place as in the DeH. Thus he had all his familiar blind spots in the same place.

The important selling point was that when the Army or Navy test pilot sat in this strange new amphibian he found himself surrounded by so familiar a wing pattern that he liked it even before he started the engine. And I believe today that much of the success in the rapid introduction of the Loening Amphibian, and its enthusiastic and world-wide reception, was due to just that. The penalty we paid by not using the monoplane design we really wanted was about 150 pounds in weight, 10 miles an hour in speed, and much, to our eye, in good looks.

New features and configurations for advanced aircraft are being written boldly for us to see right now. On supersonic aircraft, control by movable flaps must give way to control by jet air flow variation. The one or two rotor tandem helicopter may well give way to the three rotor configuration, to have all axes under direct total pitch control and not dependent on cyclic pitch which can so easily stall out on the retreating side.

Seaplanes are on their way to a new life by virtue of ski developments, and we may well return flying to the nearby airports that most large cities already have, their lakes, harbors, and rivers.

Noise must be reduced! Here is a must.

Above all, every possible angle of development must be probed in order to arrive at vertical landing and take-off, without any sacrifice in high speed. This in itself is likely to be the keynote of the coming era in design development.

Another lesson, decades old, is still with us today. Engine development is still years behind airframe development at both the research and construction level. One of the reasons, (and one of our wrong trends) is the separation of airframe and engine work. Actually, few airplanes have had an engine designed as part and parcel of the complete aircraft by one over-all design group.

In retrospect, when we contemplate air history, we find a very important fact that bears heavy emphasis today. Our really great successes in air development were always "private ventures", never government directed projects. The reason is simple; talent does not rise at the behest of a commanding officer.

So history gives us much to ponder and puzzle over, much enlightenment, and above all, encouragement when we realize that, bad as things are today, they were just as bad in previous decades.

CROSSED UP

(Continued from Page 4.)

For the correct name of the former German emblem, it is necessary to delve into the science of heraldry. And even there some confusion exists. Certain authorities refer to it as the Cross Patée (or Paty), and this error, flagrant from the heraldic standpoint, has been repeated in a well-known English book on markings of the 1914 - '18 War. The true Cross Patée is illustrated above.

The Maltese Cross is so-called because it was the emblem of the Knights of Malta, a military-religious order that evolved from the Crusades. In our brief study, no heraldic justification could be found for this terminology, the cross appearing to be a modification of the mill-rind cross. (Perhaps the "Cross Moline" could be properly applied here, but this is mere speculation). At any rate, the "correct" modern name is "Maltese Cross". (See illustration).

The true name of the German national insigne is Cross Formée (or Formy), according to the best authorities. One describes it as "following the lines of the cross patée save that its broadening ends are cut off squarely". * A heraldic description might be: "Silver, a cross formée sable". **

The straight-sided cross later adopted by Germany as the national emblem has caused further confusion. Our use of the term, "Latin Cross", in the same picture caption apparently has no justification whatever, and the proper modern description would be "Greek cross".

Considering the above facts, AERONAUTICA's editorial policy will be this: because of popular usage, the early German insigne will continue to be called "Maltese cross". However, since the term "Greek cross" doesn't seem to have the correct connotation to most people, we will in the future use the heraldic "plain cross" as the only other proper description left to us.

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COURTNEY'S CORNER

STABILITY & CONTROL

Stability, as understood today meant hardly anything during the first ten years of powered flight, and a 'stable' airplane was one which had enough control to be kept right side up without too much difficulty. Very few people appreciated real stability requirements. Even shortly before the War, a French stability competition was won by the Moreau "Aerostable" in which the pilot's seat was suspended as a sort of pendulum and operated the elevators as the nose rose and fell. "No hands" flying was merely trick stuff, and any real stability was purely coincidental.

43 70

Spinning was not recognized until 1916, in spite of the wide publicity given to the famous "Parke's Dive" sometime in 1911 or 1912. Lt. Parke, Royal Navy, flying the little Avro cabin monoplane, somehow got into what we now call a "spin" at about 3000 feet. Naturally he pulled back his stick to get out of the "dive", and merely dived steeper and spiralled faster. As he approached the ground he figured that he was practically dead anyway and might as well try anything, so he put his controls the "wrong way" and found himself in an ordinary dive from which he made a normal recovery.

Pilots frequently killed themselves (as they still do) by falling into incipient spins through stalling at low altitudes, but the spin connection was not recognized, and early records recount numerous crashes due to a "sideslip", which is what it looked like. In fact, early use of wing dihedral was often intended chiefly to combat the deadly "sideslip" rather than to provide intentional lateral stability.

Even the aerodynamics of stalling were not very clear and, since it has always been fashionable to use a foreign expression to describe something one doesn't quite understand, the French term "perte de vitesse" (loss of speed) was widely used to cover the situation.

The first practical assault on stability problems was made in early 1914 by Edward Busk, a scientist and pilot at the Royal Aircraft Factory, Farnborough. Busk was very unfortunately killed through a fire in flight, but not before he had made fundamental contributions to the understanding of inherent stability. The benefits of his work spread slowly through the aircraft industry, but it became immediately effective at the "Factory" so that, by 1916, adequate stability studies were a regular feature of its flight testing. By the middle of that year, recovery from intentional spins was almost routine.

Thus the Royal Aircraft Factory's series of planes (BE, RE, SE) though generally of otherwise mediocre design, had the great merit of being easy to fly for the hastily-trained pilots of that wartime period. The outstanding case was that of the S. E. 5, a really fine design which combined high performance with a degree of stability that greatly increased the effective supply of fighter pilots. Many of those who trained hurriedly on the S. E. 5 might have been rapidly liquidated by Camels or Spads.

The name of Edward Busk deserves to be more widely known than it appears to be outside of Britain.

Frank T. Courtney

IN FUTURE ISSUES

The development of the Antoinette monoplanes, Evolution of Civil Air Transportation, more on the 'Tin Goose', three-view drawings of the Wright 'Flyer', German "giant" aircraft of WWI.

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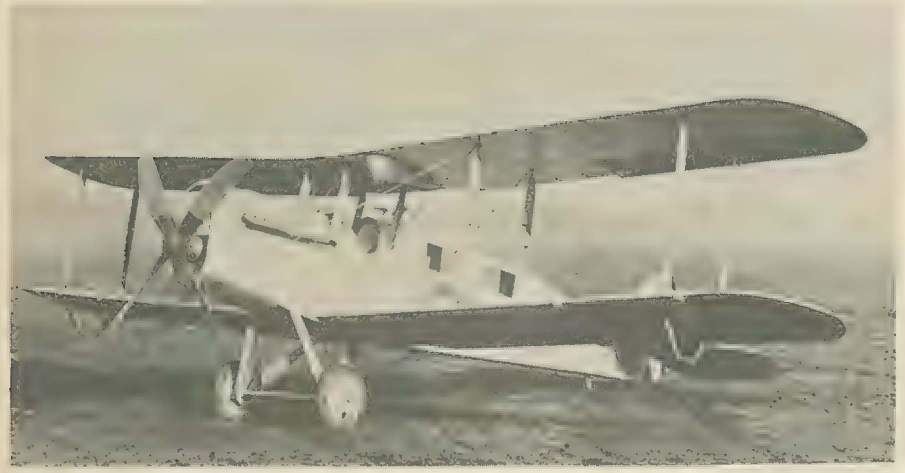


A 1919 modification of the De Havilland airplane for VIP passenger carrying as described by Mr. Courtney.

THE BIRTH OF AIR TRANSPORT

BY FRANK T. COURTNEY

On August 25, 1919, a British pilot named Bill Lawford, settled a lone civilian into the slightly remodeled cabin of a DH9a and took off from London on the world's first scheduled passenger flight. Two hours and 225 miles later he landed his passenger, plus a 200 pound freight cargo, on a Paris air field.

Thus begins the story of civil air passenger service: a great program which today spreads a reliable transportation network over the widely separated cities of the world, making the airplane a good genie to the business and vacation traveler as well as to the military man.

The puzzler in this story is that it begins in Europe, and not in the United States. Long before the Armistice, we RAF flyers, anticipating the time of peace, had believed that America would take the next and obvious step in aviation by initiating civil air passenger transportation. But for ten years after Lawford's historic flight, while we made scheduled flights in and out of Europe's cities, overcoming one after another obstacle to the inevitable establishment of a civil aviation program, we pondered the riddle: why had America not come into the world's air passenger picture?

The United States was the home of the Wright Brothers and the birthplace of their flying machine. Particularly in the vast areas West

(Continued on Page 2.)

Eric Springer

"Aeronautica" is pleased to present, through the courtesy of the Douglas Aircraft Company, El Segundo Division, the excellent story and color print of Douglas' first design, named the "Cloudster."

The main performer in the development of this aircraft was Eric Springer, who today, 33 years later, heads Douglas El Segundo as Vice President and General Manager.

Springer, a member of the Early Birds, was born on a farm near Selmer, Tennessee. He says he first obtained his interest in flying in 1908 when he wrote Sears-Roebuck for a copy of Loughead's "Vehicles of the Air." After attending Texas A & M he tried his hand at operating a garage at Pauls Valley, Oklahoma, later ferried an automobile to Los Angeles where he landed a job at the the new Ford assembly plant on Santee Street and took flying instructions after work hours from Glenn Martin, who then had a flying school at Griffith Park near Glendale. Martin designated him a full-fledged pi-

(Continued on Page 3.)

The Bristol "Jupiter" 10-seater of the early Twenties. One of the first real commercial passenger designs following the immediate post-war period.

BIRTH OF AIR TRANSPORT

(Continued from Page 1.)

of the Mississippi there was an urgent need by business men for faster transportation facilities. America obviously was better situated financially than was impoverished Europe to establish civil air services. She was not, as was Europe, hampered by international problems such as language differences, customs, post-war restrictions, etc. It is true she was providing mail service by air, and occasionally a traveller did find uncomfortable accomodations on a mail plane. But all things considered, why did the United States not follow through on her aviation lead and put civilian travelers into the air?

The answer to the riddle probably lies in the advent of the RAF Communications Flight and the Paris Peace Conference. British military men, obliged to travel between London and Paris via Channel boats and trains, complained of time lost because of the slow mode of transportation, rough water, transfers, etc. Hence the Communications Flight had been started by the RAF late in 1918. It continued until July 1919, to the complete satisfaction of the VIPs. Now, if air travel across the Channel meant greater comfort and time-saving for military men, why not for everyone?

Commercial air companies no longer regarded civilian air travel as a dream, but began setting the wheels in motion to bring about its realization. DeHavilland, for one, got together some of its wartime bombers, added two or four passenger seats in the cabins, and made whatever concessions to comfort possible in that early time. It, with other companies, requested permission to give civilians air travel service. International complications and restrictions made the venture impossible, they were told. Disappointment - and frustration - clouded their hopes, but not for long.

A champion for the cause was found in Maj. Gen. Sir Sefton Brancker, one of those chosen to represent Britain's military air interests at the Paris Peace Conference. A small, wiry fellow of tremendous nervous and physical energies, Sir Sefton was one of Britain's first airmen, and certainly an active and persuasive power in the interests of civil aviation.

Sir Sefton, at the age of 22, had served in the South African War, and between 1903 and 1912 saw service in India as an Army cavalry officer. While there he learned to fly, and at the outbreak of the Great War in 1914, was appointed deputy director of military aeronautics. Later he became director of air organization, commander of the R.F.C. in the Middle East, and controller general of equipment and personnel at headquarters. In appearance and manner he was one of the old British "super-officer" type. He wore a monocle so persistently that we sometimes wondered if he slept with it on.

Despite the many meetings at which all nations were struggling for acceptance of their own viewpoints, the Peace Conference was quite understandably an occasion of much celebration. Cocktail parties, dinners, and all sorts of social events were prominent on the conference agenda. Delegates, sandwiching many of their meetings in between these events, kept late and strenuous hours. If a meeting was scheduled for a morning hour, most delegates were likely to be at their hotels recuperating or resting, and those who did attend might just as well have stayed home.

Sir Sefton, however, always arrived at a morning meeting on time and in full possession of his wits and energies. His first proposals for commercial air service between London and Paris, however, met a decidedly unenthusiastic response. He therefore revised his proposals and launched a new tactical approach.

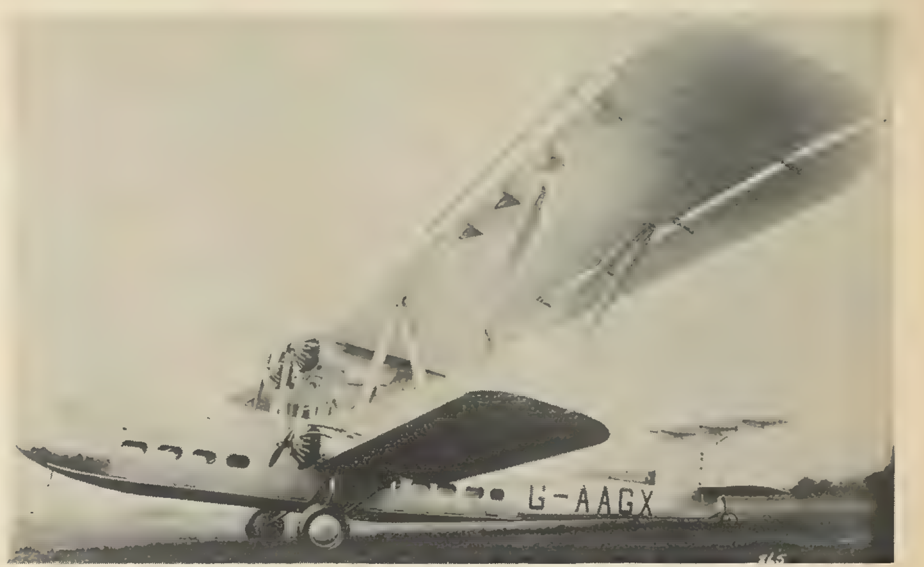
Appearing before those responsible for permitting planes to fly over French soil, Sir Sefton adjusted his monocle - and proposed another means of celebrating this wonderful peace. "Let's make it a special occasion for civilians, too," he said in effect, "by permitting them to travel by air to the conference events."

Finally he made his point, and a special permit for civilian air travel between London and Paris was issued for the week of July 14, 1919.

Actually - this demonstration week never effectively ended. The flights continued with growing pub-

(Continued on Page 12.)

The Handley-Page 42 air liner which (type) remained in service almost till World War II.



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Eric Springer (Cont'd)

lot after seven and one-half hours' flight, and he became an instructor for Martin. It was when Glenn Martin went to Cleveland to start his plane-building company and invited Springer to go with him that the test pilot's long association with Donald Douglas began.

Under Springer's management the Douglas El Segundo Division has turned out a billion dollars in planes for the Navy in the past decade and now has nearly a billion dollars worth to build for the sea-air-arm of the country's defense forces.

In the past six years the El Segundo plant has doubled in size until its square feet of building area totals three and one-half million, with six different carrier - type combat planes incorporating three types of power and three types of wings on its production lines.

Over 18,000 combat planes have been built from designs turned out at the Douglas plant Eric Springer heads, today known as the prime attack plane manufacturing facility in the world.

Springer says that despite what seemed unlimited imaginings about airplanes as a youth on the Tennessee farm, his horizons never encompassed the 1238 mph. "Skyrocket" constructed by his El Segundo plant. In 1921, he said, the 120 - mile -an- hour speed of the Douglas "Cloudster" was considered extremely fast, and foolhardy by some.

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	MYTHOLOGY	PRE-WRIGHT BROS	PRE-WWI	WWI	1919-1939	WW2	CURRENT
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AIR MEETS, RACES, SHOWS							
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AERONAUTICA

Official Publication for Historical Associates

CONTENTS

Volume 4 Number 3 & 4

FEATURES

The Birth of Air Transport, by Frank T. Courtney 1
Marcel Prevost, Aviation Pioneer 5
The First Douglas 6
The Tin Goose 7
World War One Aircraft Designations, by P. M. Bowers 8
The Evolution of the Etrich "Taube" 9
An Air Decade in Fine Art, by Eugene Clay 14
Allen F. Kitchel Model Collection 15
Catherine H. Schneider 15

DEPARTMENTS

Editorial 4
Trading Post 4

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TRADING POST

OFFERED - Pierre Seuvestre - Auguste Wimile: "La Traversee de La Manchex en Aeroplane, " 1785 to 1909, de Blanchard a Bleriot. Avec un preface de Louis Bleriot. Paris, Ernest Flammarion edit. (300 pages.)Paperbound, the cover page missing, otherwise in perfect condition. The book contains several illustrations and a tableau listing all trans-channel crossings by balloon from 1785 until Bleriots' crossing by plane, giving the distances covered and the time needed. (First and only American amongst them, F. Lahm, Sept. 1906, covering 647 kilometers in 22 hours.) Price: $5.00. Rudolph E. Engelsberg, 964 N. Holliston Ave. Pasadena 6, Calif. Phone: Syc. 44764

WANTED: The following magazines: "Air Trails" - 1937, Vol. 7, No. 5, February. 1938, Vol. 9, No.4, January. Vol. 10, No. 3, June. 1940, Vol. 13, No. 6, March. Vol. 15, No. 1, October. "Air News" - 1941, Vol. 1, No. 2, June. Vol. 1, No. 3, July. "Air Age" - 1943, Vol. 1, No. 2, March. "Air World" - 1946, Vol. 4, No. 5, July. Vol. 4, No. 6, September. Also issues of "Flying" or "Popular Aviation" before 1941 -- Buy or Trade. W. G. Haney, 1239 Rimpau Blvd. Los Angeles 19, Calif.

WANTED: Copies of "Impact," wartime U. S. A. A. F. publication. All numbers of Vol. 1; Vol. 2 Numbers 1 through 7. Also, all books written by Elliott Springs. J. J. Sloan, 5421 Penfield Avenue, Woodland Hills, Calif.

EDITORIAL

This issue of "Aeronautica" as you will note consists of sixteen pages and is therefore two-in-one. Through this expedient we hope to get back on schedule and continue with one issue every three months.

Two features appear herein for the first time. "Famous Firsts," which tells of the original production designs of well-known manufacturers, will continue until we exhaust the supply, which is not likely. We trust we will be able to induce the cooperation of all of our U. S. Aircraft Industry greats, and are certainly indebted to Douglas for the kick-off feature in which they supplied the color reproduction of the "Cloudster" painting.

Our other new feature is to reprint what may be considered classical contemporary features of aeronautical history. Many of these appeared in "Scientific American" of early vintage. The "Scientific American" has been most gracious in giving "Aeronautica" permission to reprint any aeronautical article appearing in the "Scientific American" prior to 1920. Let's not stop there -- so please let us know what rare classical treasures you have discovered which should be made available to "Aeronautica" readers.

Lastly, the chart with the coupon, covering the reader's interest, should develop many things. As noted, it will be printed again in a future issue with reader tabulation coded, so that you will know of others interested in your particular field, and thus swap ideas and items. If we have left out your field of interest, please let us know so that it can be included in a future issue.

Don't forget that "Aeronautica" is not published to satisfy a small group. If you have ideas for improvement, or an article or newsy item to submit, send it on. We can use it!

PHOTO CREDITS

Page 1: Samson Clark, Douglas Aircraft Corp. Page 2: Bristol Aeroplane Co., R. R. Martin. Page 5: Esso Air World. Page 6: Douglas Aircraft Corp. Page 7: Wm. B. Stout, Peter Bowers. Page 8: Peter Bowers. Page 15: I. A. S.

IN FUTURE ISSUES

The Hanriot Biplane, U. S. National Insignia, a three-view of the Zeppelin "Giant" R. 1, and the North American P-64.

MARCEL PRÉVOST

AVIATION PIONEER 1891-1952

Prevost in his Deperdussin racer. Winner of the Schneider Trophy race at Monaco (1913).

Maurice Prévost, famed early pilot and one of the stalwarts of aviation development, died in Paris, France on Thursday, November 27th, of a heart ailment. He was 61 years old. Since 1924 and until shortly before his demise, M. Prévost was associated in various capacities with the Aviation Department of Esso Standard S. A. F., Esso marketing affiliate for France.

Prévost's interest in aviation first asserted itself just seven years after the first flight by powered aircraft. He was the second pupil on the books of the then newly formed Deperdussin school at Betheny, near Reims, which he joined in 1910. Prévost progressed well and in April of 1911 he received his Aero Club "brevet". Less than a month later he was appointed chief pilot of the school.

Prevost at the controls of the three-seat monoplane which he placed third in the military trials of October 1911.

Prévost was soon to prove his skill as a test and demonstration pilot. In the Coupe Michelin in August, 1911, he flew 515 miles in six hours and 15 minutes before storms forced him to give up. In the French military trials at Betheny in Autumn of the same year he was third in the general classification and first in what was then called the height test. In December he set a world's height record, carrying one passenger, by reaching an altitude of 10, 496 feet.

In January of 1912 Prévost established another height record, this time with two passengers to 7, 216 feet. Competing in the Coupe Pommery in April, 1912 he set a world's distance record across country with one passenger. During the British military trials later that year Prévost placed second in the general classification and first of all French competitors. Next month Prévost competed in the Gordon Bennett Race at Chicago and finished a close second to his compatriot, Jules Vedrines. Both men were flying Deperdussin monoplanes.

1913 was Prévost's year of greatest achievement. In February he received first classification in the Spanish military trials at Madrid. Then followed victories in the first Schneider Trophy contest and the Gordon Bennett race. Prévost was the only pilot to win two major speed contests in the same year, one seaplane and one landplane; in the latter he was the first pilot in the world to fly at more than 200 kilometers per hour (124. 2 mph). In doing so, he advanced his own world's speed record of 112. 4 mph which was set the previous July.

On the less spectacular side, Prévost filled in his time with test and demonstration flying, the acceptance and delivery of production aircraft for the French Army and elsewhere in Europe. His last successes before the outbreak of World War I were at Vienna, where he captured the important speed prizes.

Mobilized in August 1914 as a pilot in the reserve, Prévost was soon recalled by Ministerial order to serve as a test and experimental pilot, and throughout the war years of 1914 - 18 he was responsible for testing hundreds of aircraft for the French and Allied governments. In 1918 he assisted in the formation of three fighter squadrons for the U. S. Army at Orly, Domremy, and Toul.

In 1920 Prévost qualified for both his private and transport pilots' licenses and continued flying until 1924 when he entered commerce and retired as an active pilot. From 1929 on and until earlier this year, Maurice Prévost headed Esso aviation marketing interests in France. His whole life of adventure and successful achievement was devoted to the service of aviation.

Prevost in the Deperdussin Type 25 exhibition monoplane.

THE FIRST DOUGLAS

On February 24, 1921, test pilot Eric Springer climbed into a trim tractor biplane at the Goodyear Field in Los Angeles, gunned the 400 horses of the craft's Liberty 12 and took up the first plane Donald W. Douglas designed with his own name in the title of the company.

The airplane was the "Cloudster," forerunner of hundreds and hundreds of Douglas-designed aircraft Eric Springer was to test-fly in the next decade.

The "Cloudster" wasn't the first plane designed by Donald Douglas that Eric Springer had flown. Young Douglas had been Chief Engineer and Eric Springer, Chief Test Pilot, for Glenn Martin in Cleveland, Ohio, where Springer flew many of the planes Douglas designed for Martin. Among them was the renowned "Martin Bomber", said to be the first and most advanced of its type in the country.

In 1920 Donald Douglas went to California to scrounge out his own start in the aircraft business. There he met David R. Davis, a wealthy sportsman, who wanted a plane built to try for records. At Douglas' behest, Eric Springer and several others from the Martin plant came west to join the young engineer in the "Davis-Douglas Company." They found Douglas designing the "Cloudster" in space rented in a barbershop on Pico Boulevard in Los Angeles. Subsequently, they built the "Cloudster" on the second floor of a planing mill, using the woodworking machinery that was available.

After a series of successful test flights, Eric Springer, March 29, 1921, flew the silver and blue biplane to 19,160 feet to establish a new Pacific Coast altitude record.

Tests had shown the "Cloudster" could carry enough fuel to cruise at 85 mph. for 33 hours or some 2800 miles, and the attempt was made to fly across the country non-stop, a feat up until then unaccomplished.

For the attempt the "Cloudster" was loaded with 70 gallons of gasoline, 55 gallons of oil and 24 gallons of water, a load weighing more than 5,000 pounds. The gasoline was carried in three main tanks located in the fuselage between the pilot's seat and engine and in several smaller tanks, fuel enough to keep the plane aloft for 28 hours. Fully loaded, she weighed 9200 pounds. The craft measured 56 feet from wingtip to wingtip, was 36 feet long and 14 feet high. Its instrument board mounted two compasses, an air-speed indicator and pressure gauges. It had a wide-open speed of 120 mph.

On June 27, 1921, Eric Springer took the "Cloudster" off from March Field at Riverside, Calif., fighting her heavy load to gain a few feet of altitude. This is said to be the first time in aviation history a plane successfully carried the equivalent of its own weight. The "Cloudster" is also said to be the first plane to attain material increase in speed by streamlining, the first equipped with gas dump valves and with a practically effective instrument board to guide the pilot.

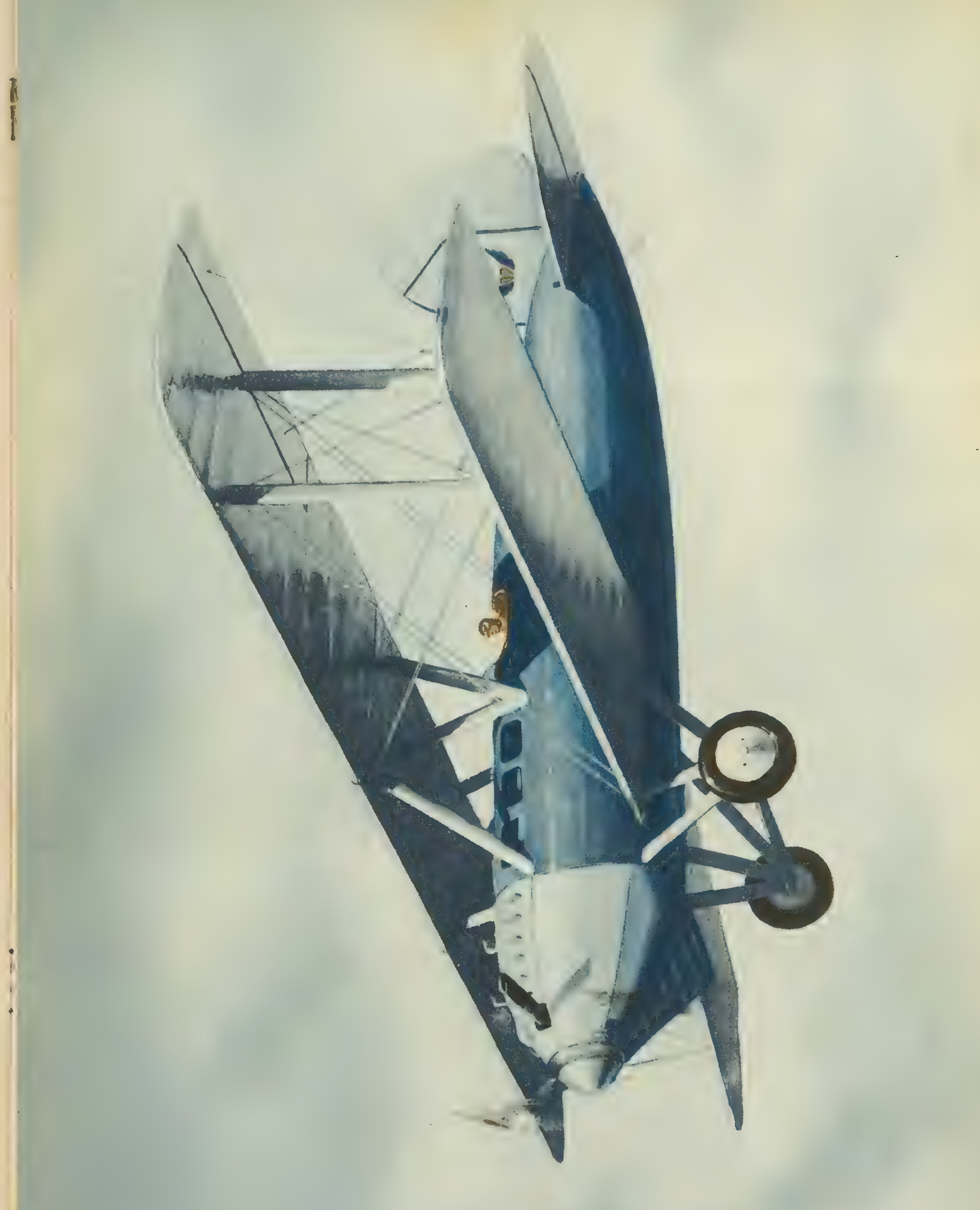
Springer, with David R. Davis, flew the sturdy biplane over the California line into Arizona bucking 500 foot drops from bumpy mountain drafts, followed by slow climbs to regain altitude, then onward through New Mexico. The time schedule was good. They reached the spaces over Texas, then, like many of Man's projects of "great pith and moment," things went awry; the engine quit.

The teeth in the timing gear had stripped. Springer executed a dead-stick landing at Fort Bliss near El Paso. The men were lucky in the sense that had the engine stopped over the mountains they would have been in desperate straits, but unlucky for the success of their non-stop cross-country venture.

It was necessary to repair and fly the "Cloudster" back to the coast for an engine re-work. On May 23, 1923, while Donald Douglas and his crew worked on the "Cloudster's" engine, newspapers bannered the news the nation had been spanned non-stop by air. Army Lieutenants Kelly and Macready had landed at San Diego that noon

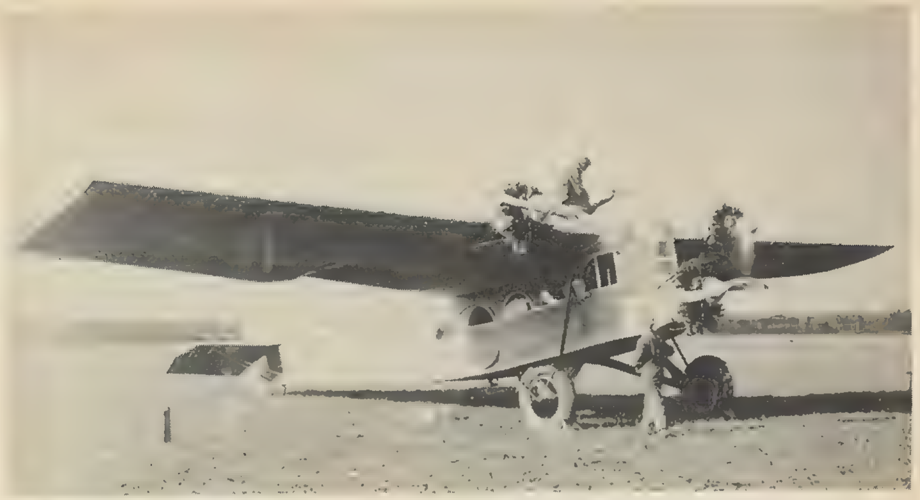
(Continued on Page 15.)

Test Pilot Eric Springer beside the Douglas "Cloudster" in 1921.

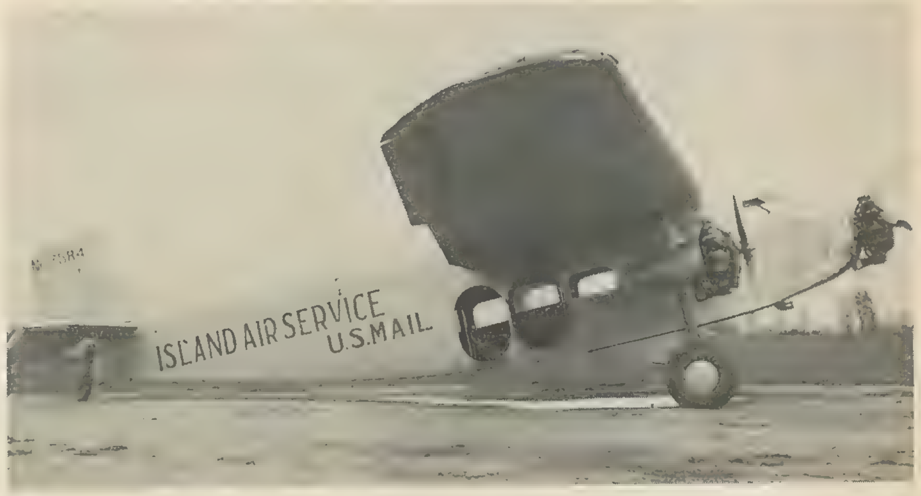


Douglas "Cloudster"

TIN GOOSE



The original Ford-Stout trimotor which was destroyed in a fire at Dearborn before its first flight.



Milton Hirschberger's "Tin Goose," still in service at Put-In-Bay, Ohio.

Last year's tale of the "Tin Goose" brought forth responses from two well-qualified experts on the subject. From Phoenix, Arizona, came a communique from Wm. B. Stout, designer and associate of Edsel Ford in the Trimotor development. Mr. Wm. T. Larkins, at the University of California, also a Ford fan, is in the throes of a project of major magnitude: running down the life history of each and every Ford Trimotor ever built. With material from these and other sources, this second installment on the "Tin Goose" has been compiled.

From Bill Stout it was learned that "the original Trimotor (completed Nov. 1, 1925 - author) destroyed by the fire had the motors up in the wings where they should have been, but due to the insistence of Shorty Schroeder and the pilots of that day, National Air Transport, who bought the second plane (October, 1926 - author), required that we put the pilot outdoors in a cockpit above the wing where he could 'feel the wind on his face to see if he was sideslipping.' After one winter trip, however, they sent the plane back to Dearborn to have the cabin put back on. This plane had three J-4s of 200 hp."

The impression of Ford performance in the reliability tours was corrected by the information that "three of the Tours in a row were won by the Ford piloted by Harry Brooks with Harry Russell as mechanic in competition with Fokker and the rest. After having won the Trophy three times in succession, Bill Stout had the embarrassing experience of presenting the Trophy to his own group at the final banquet. The Ford Tours were, of course, conducted under outside control."

Mr. Stout, who still flies in one of the remaining Trimotors located in the Phoenix area, has complete confidence in its structural integrity. The CAA has no record of any accident to a Ford Trimotor through a structural failure. Not only have Fords operated in overload conditions in the Central Americas for many years but "one plane in getting civilians out of Bataan peninsula did 500 miles twice a day over the ocean in evacuation work with a 40 percent passenger overload." The one remaining J-6 Trimotor known to be in scheduled airline service is operated by Island Air Service at Put-In-Bay, Ohio. "Flying over Lake Erie, it is probably the shortest airline and the only aerial school bus in the world! The airline maintains a schedule, pays a dividend, its maximum allowable ceiling is 400 feet and its owner is pilot, ticket chopper, flight handler, steward and mechanic, as well as contractor."

The editors of "Aeronautica" hope that W. T. Larkins will shortly be able to make his complete story on Fords available to its readers. Aside from a detailed biography of each "Goose" we hope to learn more about the 12 Ford Trimotors that are still flying. "Perhaps the most interesting of all is 5-AT-B, number 5-AT-40, which was built as NC-9684 and is now N-69905 up in Orofina, Idaho. It was brought back from Cuba after the war by Milton Hershberger, of Put-In-Bay, and modified to take three 450 hp Wrights. It now has those engines, plus Lockheed "Lodestar" wheels, and the oleo struts from a P-47 "Thunderbolt."

LOCATION	TYPE	REGISTRATION	SERIAL NUMBER	OWNER
Phoenix, Arizona	4-AT-E	N-8407	4AT-69	Rex Williams
Orofino, Idaho	4-AT-E	N-9612	4AT-55	Abe Bowler
Orofino, Idaho	5-AT-B Modified	N-69905	5AT-40	Charles Frensdorf
Missoula, Montana	4-AT-E	N-7861	4AT-46	Johnson Flying Service
Missoula, Montana	4-AT-E	N-8400	4AT-62	Johnson Flying Service
Missoula, Montana *	4-AT-E	N-9642	4AT-58	Johnson Flying Service
Missoula, Montana	5-AT-C	N-8419	5AT-58	Johnson Flying Service
Choteau, Montana	5-AT-B	N-9606	5AT-4	Northwest Agricultural Aviation, Inc.
Choteau, Montana	5-AT-C	N-414H	5AT-74	Northwest Agricultural Aviation, Inc.
Put-In-Bay, Ohio	4-AT-B	N-7584	4AT-38	Milton Hirschberger
Put-In-Bay, Ohio	4-AT-B	N-7684	4AT-42	Milton Hirschberger
Put-In-Bay, Ohio	4-AT-B	N-9610	4AT-53	Milton Hirschberger

*Based at McCall, Idaho, during the summer months for U.S.Forest Service contract work dropping Smokejumpers.

WORLD WAR ONE AIRCRAFT DESIGNATIONS

BY PETER M. BOWERS

Only two of the nations engaged in the first World War, Germany and France, had anything approaching system in the designation of their military aircraft. The methodical Germans had the first and the best system, adopted in 1913.

At that time, there were only two basic aircraft types in the service of the Luftwaffe, the German Army Air Force. These were unarmed two-seater monoplanes, mostly of the popular "Taube" pattern, designated as type "A", and unarmed two-seater biplanes, designated type "B". By mid-1915, the demands of war had produced a new type, the 160 horsepower two-seater with a flexibly-mounted machine gun in the rear seat, known as type "C". Unable to defend themselves, the lower-powered "A's" and "B's" were withdrawn from the front and used for training. The "A's" went out of production, but the "B's" remained in production until the Armistice, the letter coming to mean "Trainer."

When single-seat fighters appeared late in 1915, distinction was made between them on the same basis, "D" for "Doppeldecker," or biplane, and "E" for "Eindecker," or monoplane. In 1917, the appearance of the triplane fighter on the scene produced the Designation "Dr" for "Dreidecker" or triplane. The monoplane fighter dropped from the scene in 1916, and the "E" designation disappeared, although it reappeared briefly in mid-1918. The original service designation of the Fokker D-VIII was "E-V" but the "D" had become so synonymous with fighters in general that the Fokker, though a monoplane, was given the biplane's designation.

When multi-engine types first appeared in service in 1915, they were not considered as bombers, but as flying battleships, and the letter "K" for "Kreigsflugzeug" or "Battleplane" appeared. The battleship concept did not work out, however, and the "K" was dropped in favor of "G" for "Grossflugzeug" or large airplane, one having two engines. Types with three or more engines began to appear late in 1915, and to distinguish them from the twins, the letter "R" for "Reisenflugzeug" - or "giant airplane" was used.

In 1917, a new type appeared, a beefed-up version of the standard "C" type but with higher power and armor plate for use in attacking ground troops, and was designated "J". Later in the year, another modification of the "C" appeared, a higher powered version used for night bombing with the designation "N" for "Nachtflugzeug." 1918 saw only one new designation appear, "S" for "Schlachtflugzeug" - an unarmored ground-fighter, but the designation was not used alone, for by that time, new aircraft types resulted in combined designations. "C" types were redesigned for lighter weight and increased maneuverability to suit them as two-seater fighters, and were designated "CL" or lightweight "C". The only design to fly with the "S" was a triple designation, the "CLS". The "L" was applied to bombers, too, as "GL" - light fast designs intended to outrun the defensive fighters instead of fighting their way through them. Armored single seat fighters for ground attack were given the combined designation of "DJ". Ordinarily, designs were not produced in two versions except in the case of the Gotha G and GL-VII and G and GL-VIII.

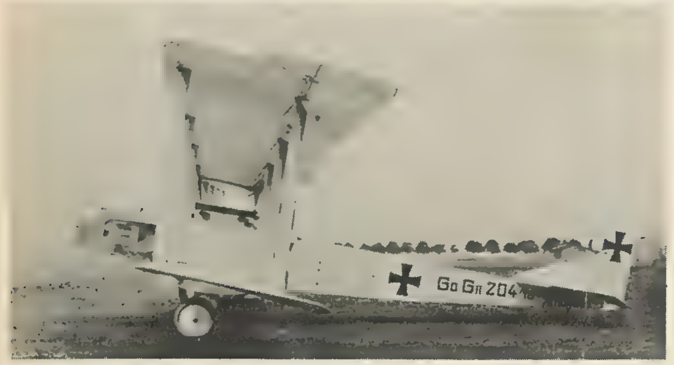
One non-standard designation that worked its way into service use was the "F" applied by Tony Fokker to the special Dr-1 that he built for Richthofen. This appears nowhere in official German data, but shows up clearly in certain photos of the Red Baron's ship.

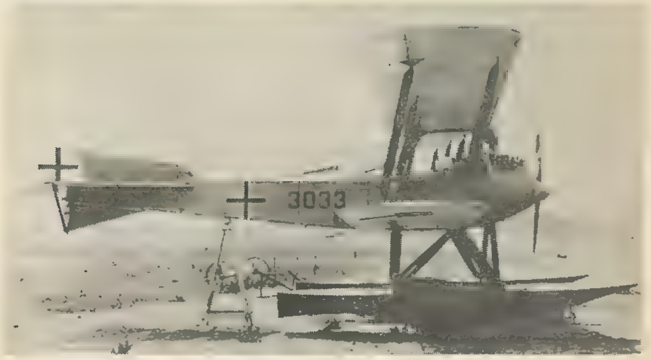
Other information was presented along with the designation, either on both sides of the fuselage between the cockpit and the tail, or on either side of the vertical fin. At first, this included only the type letter, the number of the particular airplane of that type, and the last two digits of the year, B. 558/15 being the 558th airplane procured in 1915. As more manufacturers supplied the army and as later models appeared, the system expanded to include the name of the manufacturer and the sequence of models procured from him in any one type category. Fok. D-III 350/16 would identify the plane as being the third biplane fighter design accepted for service use from Fokker, and that it was the 350th plane procured in 1916. If a design was built by subcontractors, the fact was indicated, as Go. G-IX(LVG)-257/18 being a Gotha G-IX built by L. V. G. A complete list of the abbreviations used to identify the German manufacturers appears at the end of this article.

Letters to identify subsequent modifications of a basic model were used only slightly. Roland got to the D-VIb, but Fokker, with such a major change as a switch from a 160-HP Mercedes to a 185-HP B. M. W. in the D-VII did not bother to indicate the fact, nor did the Luftwaffe insist on it. In general, an engine change was good for a whole new model number, the only difference between a Halberstadt D-II and D-III, for example, being the 120 HP Mercedes in the II and the 120 HP Argus in the III. In some cases, letters were used for special purposes, "K" identifying standard types fitted with cannon and "W" standard landplane designs fitted with floats as "Wasserflugzeug."

The Imperial Naval Air Service did not use the Army's system, but merely used the manufacturer's own model designations. Early in the war, the two principal suppliers of seaplanes, Albatros and Brandenburg, used a very random system of letters to designate their various models, but later on, this became systematized, both settling on "W" to distinguish their seaplane designs from their landplanes, with numbers being assigned to consecutive models. Several other manufacturers also adopted the "W", so it became necessary for the Naval authorities to approve numbers be-

(Continued on Page 13.)





The Evolution of the Etrich "Taube"

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Fig. 1

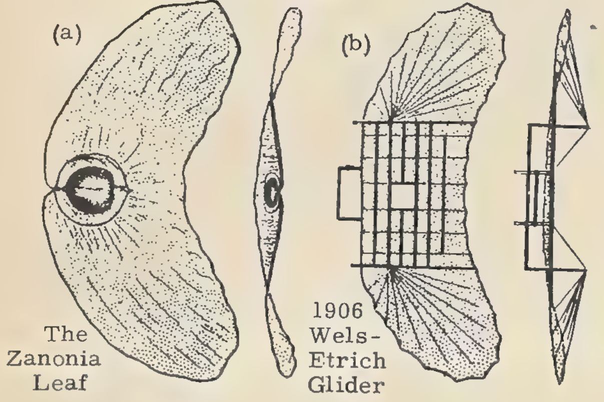
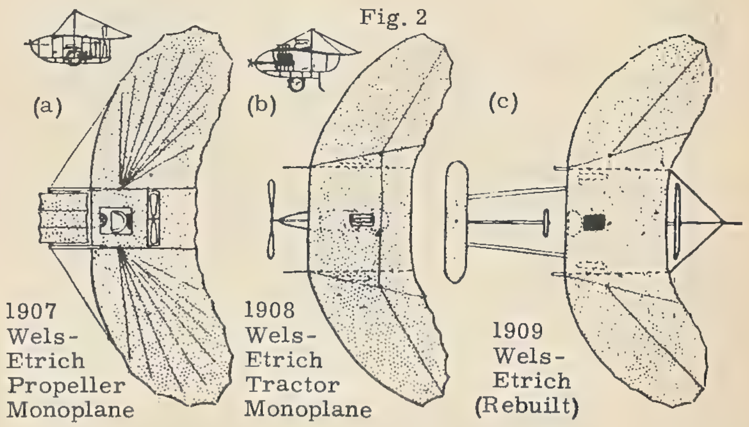


Fig. 2


(a)
1907 Wels-Etrich Propeller Monoplane
(b)
1908 Wels-Etrich Tractor Monoplane
(c)
1909 Wels-Etrich (Rebuilt)

The evolution of the Etrich "Taube" monoplane, a type upon which so many different makes of German machines are based, is not only of special interest just now on account of the prominence of the "Taube" in the daily events of the present war, but is in itself a particularly interesting subject from the historical point of view. "Taube," as no doubt, most readers know, is simply the German for dove, and, as will be seen later, the different types of Etrich machines are designated by the names of various birds, owing to the fact that the planes are wing-shaped. As a matter of fact, this design does not derive its origin from the bird, but from the seed-leaf of the Zanonia palm, which possesses remarkable gliding properties when dried. From the sketch of this leaf (*a*), Fig. 1, it will be seen that the seed-pod has been provided by Nature with a perfect gliding mechanism in the shape of a crescent-shaped leaf. When the leaf dries the extremities curl both laterally and longitudinally, with the result that when the seed is ripe and falls from the tree, it makes a long stable glide to the ground. This fact was noted in a brochure written by Prof. Ahlborn, and it was this which first attracted the attention of Herr Igo Etrich, an Austrian, whose father, Herr Ignaz Etrich, had started in 1898 to carry on the work of Otto Lilienthal, having bought the original gliders of that pioneer. A thorough study of the Zanonia leaf proved to be no easy matter owing to the difficulty first of obtaining specimens and then of observing the curves assumed by the leaf when gliding. However, a number of paper models were made, and the results convinced Herr Etrich that in a machine constructed on these lines would be found the solution of the problem of making a flying machine automatically stable.

In conjunction with Franz Wels, he set to work, and a large glider, 12 meter span and weighing 20 kilogrammes, was built in 1904, the framework being bamboo. With a load of 25 kilogrammes, several hundred very successful glides were made, the apparatus showing a marked degree of stability. The success of these experiments induced Etrich and Wels to go a step further and endeavor to obtain prolonged horizontal flights. To this end they constructed another model, to which they fitted a 3½ horse-power Laurin and Klement motor cycle engine. This machine had two ski-like skids, and was tested over snow, but the experiments met with little success, the machine never leaving the ground, owing, no doubt, to insufficient power and the incorrect location of line of thrust. The next move was to construct the large man-carrying glider (*b*) Fig. 1, and this was completed in 1906. It had an area of 35 square meters, with a span of about 12 meters, and weighed, light, 164 kilogrammes. It was built up in three sections, the central section being supported on a skid under-carriage. In the center, near the leading edge, an opening was cut in the plane for the pilot, who stood upright and held on to the cross beam in front of him. By swaying his body he could, to a certain extent, correct any rolling or pitching of the glider, caused by wind gusts, etc., but there was no other means of control. With 70 kilogrammes sand ballast numerous successful glides were made, some about 300 meters in length, while equally encouraging glides were effected with Wels on board. On October 2d, 1906, three flights of 150, 180 and 225 meters in length respectively were accomplished, the average height being about 10 meters. Four more glides were made on October 8th. All these glides were started by running the glider on a small truck down an incline of 28 per cent, the glider "taking the air" when a certain speed was reached. When gliding the speed attained was from 13 to 15 meters per second, while the gliding angle was 7 or 8 degrees.

The experiments of Santos Dumont prompted Etrich to try once more power-driven flights, this time on a larger scale, so a 24 horse-power Antoinette engine was obtained and installed in the glider as shown in (*a*) Fig. 2. It will be seen that the planes still followed very closely the Zanonia leaf, but in order to effect better directional control a small elevator was fitted in front close up to the leading edge, while it was also possible to flex the wing tips. The engine was mounted below the plane in the under-carriage frame, and driven by means of a chain a crude form of variable-pitch pro-

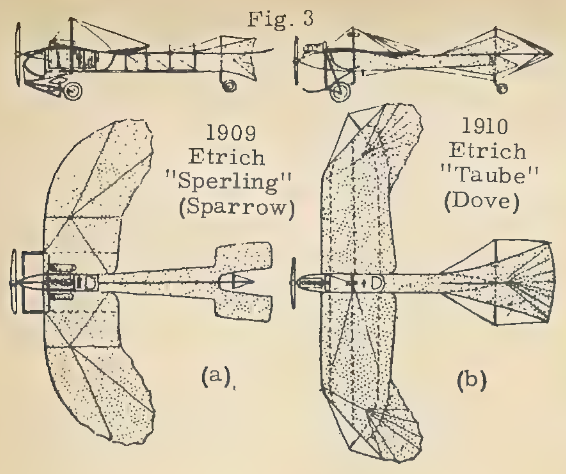


Fig. 3

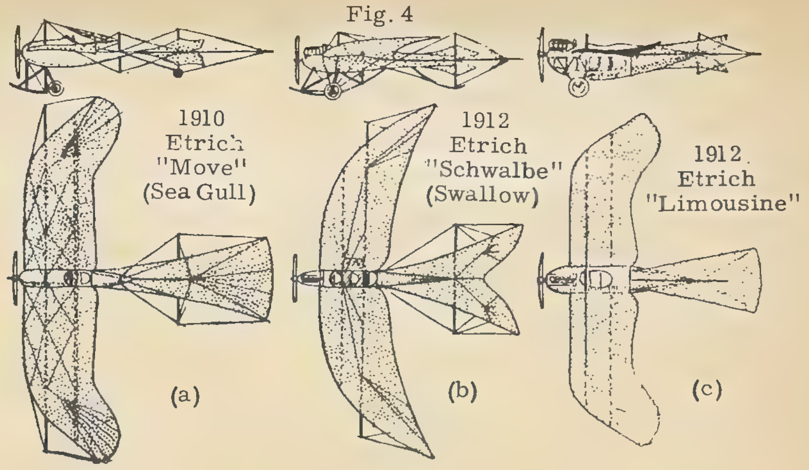


Fig. 4

peller located slightly below, and almost in the center of the plane, a portion of the latter being cut away so as to clear the propeller. The pilot was seated in much the same position as on the glider, and controlled the elevator by means of the pedal, the wing tips and the pitch of the propeller blades being operated by hand wheels. The under-carriage consisted of two solidly-built skids, and a pair of running wheels, supporting the plane about 1 meter above it by bamboo struts. This machine had a span of about 10 meters, and an overall length of 5.4 meters, the chord at the center being 4.25 meters. Etrich had originally intended fitting a 50 horse-power engine, but Wels favored one of smaller horse-power, and persuaded him to fit the 24 horse-power engine. The ultimate trials, however, proved that this was by no means a powerful enough engine, and once again they failed to obtain extended flights. It is true that one or two hops were made, but these, it must be owned, were due to sudden wind gusts. However, they continued experimenting along these lines, making various alterations in design. For instance, the second trials, in 1908, were made with a tractor machine (*b*) Fig. 2. The Zanonia-form plane remained much the same, and the 24 horse-power Antoinette engine was still employed, but the whole machine was considerably lighter. The engine was mounted forward under the plane, and drove a tractor screw direct, while the pilot sat behind the engine, also under the plane. The under-carriage consisted of a single framework to which was sprung, by means of full elliptic springs, a pair of running wheels. Behind the latter were two skids which prevented the machine from tilting over backwards. Although in some respects a distinct improvement on the previous model, this machine also was a failure, and did not appear to possess the stability of the original glider, while the advisability of fitting an elevator was also demonstrated. It was not until the next year, 1909, that Etrich, working on his own account—Wels having left him—achieved any notable success, making short flights on the old Wels-Etrich machine. He had made several alterations to this machine, (*c*) Fig. 2, notably the fitting of a front elevator, a rear vertical rudder, and a propeller mounted immediately behind the trailing edge. He also subsequently fitted an Anzani engine in place of the Antoinette. The first flight on this old machine was made on July 20th, when a distance of nearly 100 meters was flown, after which several other "hops" were accomplished from time to time until it "disintegrated" in September, the same year. In the meanwhile, Etrich was engaged in the construction of an improved type of machine on the Zanonia principle, for although he had made the old machine fly there was a marked lack of the stability experienced with the glider. He was, however, convinced he was working in the right direction, and his new machine, completed in the summer of 1909, bore out his convictions during its ultimate trials. Etrich I, "Sperling" or "Sparrow," (*a*) Fig. 3, embodied in a crude way the main characteristics of the present-day "Taube"—tractor screw, engine mounted right in front, modified Zanonia-form wings, and elevator-rudder-tail-planes mounted on a *fuselage* extending rearwards from the wings. The latter were not so crescent-shaped as those on the previous types, the leading edge being straight for more than one third the span, the wing tips swept back and only slightly up-turned. They were built up in three sections, and had a total area of 30 square meters, the angle of the incidence being 8 degrees.

The tail consisted of a long narrow surface extending from the wings and branching into a fork at the rear, forming two rectangular surfaces. These acted as elevators, and were peculiar in that they were up-turned. In between the elevators was a vertical fan-shaped warping rudder. The whole of the tail was carried by a girder structure consisting of two longitudinals, one above the other. In its original form the under-carriage was a clumsy affair, as shown, but later a more efficient type was fitted, somewhat similar to that of the Blériot. The engine, a 53 horse-power water-cooled Clerget, was mounted in the front of the rather wide body frame, with the radiators on either side. Behind the engine sat the pilot. On this machine Etrich put up several successful flights—real flights this time—ranging from 300 meters to 4½ kilometers in length at a speed of about 70 kilometers per hour. He found it very stable, and on several occasions flew without operating the control.

From the experience obtained with this machine Etrich, during the latter part of 1909, got out the design of a second machine, Etrich II, the "Taube" or "Dove," (*b*) Fig. 3, which was the first of numerous subsequent "Tauben" that differed but little from the Etrich II. Illustrations of various Etrich monoplanes that have appeared in *Flight* from time to time,[1] show how the design remained practically the same throughout, the only difference being in dimensions and constructional details. Etrich II had a span of 14 meters, a supporting surface of 32 square meters, and an overall length of 10 meters. The wings had a somewhat different shape to the predecessors, the leading edge being straight for nearly the whole span, and only the extremities swept back and up-turned. They were in two sections, one mounted on either side of a covered-in body, in the orthodox style, and cable braced from a central A mast on the body. Subsequently a girder understructure, extending from the body under the wings, was employed as an additional bracing, which formed a feature of nearly all Etrich machines until quite recently. The tail consisted of a horizontal fan-shaped surface, mounted on the top of the body, with a flexible trailing edge acting as an elevator. Above and below this were two diamond-shaped vertical surfaces, which acted as fins and rudders. The engine, a 50 horse-power Clerget, was mounted in the nose of the body, and drove a tractor screw direct, while the pilot sat in a cockpit behind. The original under-carriage was of the Blériot type, with a central hockey-like skid. A large number of important flights were made on this machine—completed at the end of 1909—with the result that several were constructed.

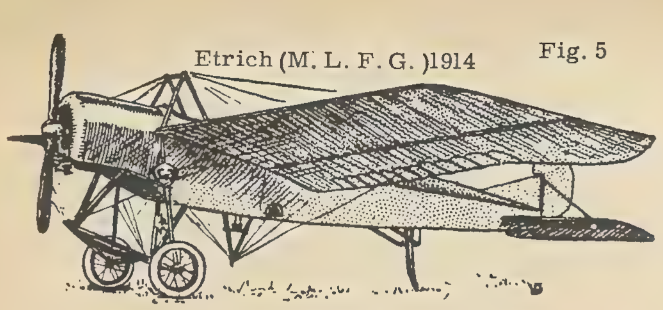

Etrich (M. L. F. G.) 1914

Fig. 5

The next machine to be built (in 1910), however, was more or less an experiment, and differed somewhat in construction. The main difference, as will be seen on referring to (*a*) Fig. 4, consisted of the short streamline body and the landing carriage. The former terminated just behind the wings, which had a similar plan-form as Etrich II, where the tail commenced—a similar practice to that followed just recently by Fokker on his monoplanes. The wings were braced to a central A mast and by four king posts, a wheel being fitted to the lower extremities of each outer king post. The under-carriage consisted of a single central skid, behind which was sprung a wheel. The engine, a 60 horse-power Clerget, was mounted in the nose of the body, and the pilot sat behind. This machine had a span of 15 meters, a supporting area of 32 square meters, and a length of 10 meters, its total weight, ready for the air, being 460 kilogrammes. It had a speed of 80 kilometers per hour.

Another experimental machine was the "Schwalbe" or "Swallow," (*b*) Fig. 4, built in 1912. The wings of this machine were almost true crescent-shape, the leading edge being curved from tip to tip. They were set at a dihedral angle and upturned at the tips, and the right-hand wing had a small window formed in it close to the body. The flexing elevator-tail was swallow-shape, and had the usual two diamond-shaped rudder-fins above and below it. The body, circular in section, was built up of tubular steel longitudinals and wooden rings, the whole being covered with fabric. In the nose of the body was the 60 horse-power engine, with the radiator immediately behind it. Behind this were three seats, one behind the other, the last being the pilot's. The control consisted of a vertical column and wheel, a backwards and forwards movement of the former operating the elevator, and a rotating of the latter actuating the rudders; no wing warping was employed, the flexibility of the wings alone being relied upon to maintain lateral stability. The chassis consisted of a central skid connected to the body by three pairs of V struts, and a sprung axle carrying a pair of wheels. The "Swallow," which was constructed mostly of steel, had a span of 13.25 meters, an overall length of 8.7 meters, weighed 45 kilogrammes, and had a speed of 112 kilometers per hour with three up. Another machine, (*c*) Fig. 4, was a totally inclosed military monoplane built in 1912. The wings were of orthodox Etrich form, cable braced top and bottom, having a span of 12 meters. The fish-shaped body was built up of wooden channel-section longitudinals, and wooden rings, covered with sheet aluminium from the nose to just behind the wings, and with fabric for the remainder. The wings were attached to the body high up, and the sides of the body underneath were cut so as to form windows. Inside the body were four seats, two pairs in tandem, the pilot being at the rear. The windows were of wire gauze and celluloid. A 60 horse-power Austro-Daimler engine was mounted high up in the nose of the body. The under-carriage consisted of a tubular axle and pair of wheels connected to the body by four tubular steel struts. Later this machine was altered, the seats were placed higher up, so that the pilot and passenger protruded above the body, while an additional wheel was mounted under the nose. Neither of these two machines showed to any particular advantage, and did not, therefore, form an important part of the Etrich programme. Fig. 5 shows the latest form of Etrich monoplane. The wings are of a modified Etrich form, with the tips only slightly swept back and up-turned. They are cable-braced in the orthodox monoplane style. The tail is of the hinged elevator type, with a partially balanced rudder and vertical fin above it. The body somewhat resembles that of the Morane-Saulnier, the pilot and passenger being similarly seated. The engine is an 80 horse-power Gnome, mounted in the nose of the body under a metal cowl. The under-carriage consists of a central short skid connected to the body by two pairs of V struts, and a divided axle, carrying a pair of wheels. The outer ends of the axle are connected to the body by two shock-absorbing rods.

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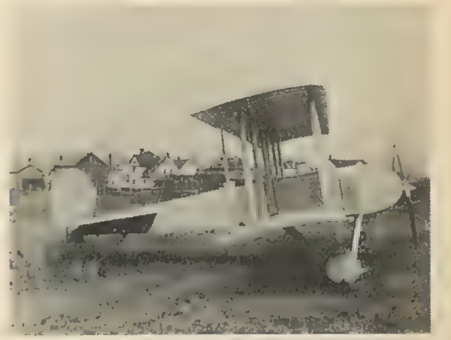
[1] Vol. II, p. 377; Vol. III, pp. 382 and 973; Vol. V, p. 1127; and Vol. VI, p. 899.

A WHATSIT?

If any of our readers can identify this airplane, it is desired that all available information be forwarded to the Editors.



BIRTH OF AIR TRANSPORT

(Continued from Page 2.)

lic patronage. Aircraft Transport and Travel was established as an airline branch of a company headed by DeHavilland. In one of these A T & T planes Bill Lawford lifted his remodeled World War I bomber to make the world's first scheduled civilian air passenger flight - on August 25, 1919. The same plane, carrying two passengers, made the reverse flight on the same day in 2 hours, 10 minutes.

Sir Sefton became director of civil aviation in 1922. In a sense, he died helping open a new air route, for Britain. For despite a premonition that all would not be well, he was with the distinguished company aboard the R-101 when it crashed in France while en route to India for the opening of an air service. His son John, whom I knew as a little fellow, and of whom his father was most proud, later joined the British Airways. Years later, when I was associated with Boeing, John planed into Seattle. Imagine the memories that returned when the son of Maj. Gen. Sir William Sefton Brancker strode across the runway and peered at us through a monocle!

Because the fare - $75.00 each way - was prohibitive to most Europeans, the great majority of the first air passengers were Americans. To "do" London to Paris, or vice versa, by air became a great fad for traveling Americans, and fortunately for the new airlines, they had the money to indulge in this novelty. A ticket was good from hotel to hotel, and the average time for the complete journey was four hours. This time has not been bettered by much today. Indeed, it was 1939 before the time was reduced at all.

During the first several years, however, passengers' psychological reaction to air travel showed itself in a behaviour pattern motivated, we suspected, by fear. This pattern all too often threatened our time schedule. Many times the passenger would be late, and the limousine or whatever vehicle was sent to pick him up at his hotel had to wait. When at last the reluctant "fare" reached the plane, he was likely to spend time in conversation or argument with others at the airport. When he was finally persuaded to board the plane, his bearing and expression would depict the attitude - "We who are about to die -"

Thus a plane scheduled for a 9 o'clock take-off left when its passengers were finally shut into the cabin. It was not until I saw a nursemaid with two children, calmly waiting to board a plane, that I knew the public was taking to the air without fear.

Despite the passengers' attitude, there were singularly few accidents and few forced landings due to engine trouble. Napier and Rolls Royce engines were reliable and well-maintained. Bad weather was most likely to bring a pilot down.

By arrangement with the railways, a pilot who was forced to land, could flag down a train and send his travelers by rail to their destinations. But train travel held no thrill for the man who had worked up sufficient courage to undertake a plane trip. He would frequently insist on "staying put" until weather permitted another take-off. In short, he was voluably unhappy, except in certain instances. Should an inn be in the vicinity, the wait would become a very sociable, even an hilarious occasion.

Progress

Within a week of Lawford's initial passenger flight, Handley Page was ready for passenger service with a converted bomber. One after another company entered the picture. In the first three months of service, regularity averaged about 95%, and speed about 120 mph. Civil aviation apparently was here to stay.

DeHavilland and others rushed in with bigger designs to expand the business. New British lines were the Instone (shipping), and Daimler (transport). With foreign lines also in service, routes were extended. Rotterdam, Amsterdam, and Berlin became points of destination. Cologne, where Britain had an army of occupation, was visited each day before breakfast by planes carrying the morning newspapers. England eventually had four airlines running, with surprisingly few casualties.

By 1920 manufacturers were providing special aircraft for the service, such as the 12-passenger Vickers Vimy 2-engine whose speed was 100 mph; D. H. 18 single engine, one crew, eight passengers, speed 100; H. P. W-8 twin engine, 20 passengers, speed 85. And in 1921, the D. H. 34 single engine, two crew, equipped with toilet facilities; Fokker, Goliath, Spad, Junkers, Dornier, and others. Most firms were at work on new aircraft.

Operations, 1919 - 1925

In the first years of civil flying, between 1919 and 1925, there was no such thing as traffic control. Pilots loaded their passengers into the cabins, cleared their papers and pushed off. Navigational aids were unknown. International differences in thought prevented the standardization of rules and equipment. We flew a course as we saw it, and when night blacked out landmarks, we completed our flight as quickly as possible and "roosted" until daylight. The only visual aid for night in those days was provided by the French who added a vertical beam on their coastal lighthouses. By day we followed familiar landmarks, spotted our positions by deserted wartime emergency airports, train tracks, etc.

To a certain extent, however, our Marconis served us well. With a single frequency of 500 kc, they operated at a minimum of 75 miles and often in a radius of 250 miles. The trailing antennas and weights, however, frequently dropped away, causing bitter complaints from farmers through whose roofs they plunged.

Language problems were accentuated through the use of the early Marconis, and often left us guessing at the answer to our questions.

"How's the weather behind you?" we once radiod a passing French plane. "There are BOLSENS in the Channel!" came the answer. Now I don't know what "Bolsens" meant to him, but it meant absolutely nothing to me. Such interchanges were a regular practice, since any other methods of reporting and forecasting the weather were poor.

Pilots of these early civil flights were almost invariably ex-military men, and from the earliest they were examined in specific aircraft characteristics for their licenses. Often the civil program was the opportunity for development of a pilot whose war record had not been particularly brilliant.

Within several years civil aviation, as viewed by passengers, became a matter of utility, rather than adventure. Of course there were still Americans who just had to "do" London to Paris by air. It was time, however, for flights to operate strictly on schedule, and through the efforts of Maj. George Humphrey-Woods, of Daimler, for many years general manager of Imperial Airways, closer schedules were established.

Still, failure of various countries to coordinate practices plagued us for years. Customs, passports, shipping procedures and forms, and difficult officers who met our foreign flights, kept us in constant consternation and trouble.

Eventually air mail was entrusted to us, and we believed this a good sign that we were finally gaining the confidence of the government and the people. Special boxes for collection of air mail were set up, but unfortunately they were so badly placed that the public actually had to hunt for them. By the time one was located, the sender usually had mailed a duplicate letter by surface route. The public paid sixty cents per ounce to send a letter or package, but perhaps they were worth that price as souvenirs.

1925 - Imperial Airways.

By 1925 England had four companies and one small seaplane line engaged in civil flights. The old timers had held on - but now they had to face a financial crisis. They were losing money, so there was nothing for expansion. Government assistance was asked.

Mr. Churchill, however, had a discouraging answer. "Civil aviation must fly by itself," he said.

Not until a close-down of the companies was threatened did the government begin to listen to their pleas. Finally it offered a grant of a million pounds, to last for ten years, providing all existing airlines in Britain were merged into one.

As a result Imperial Airways was organized. And now, with government aid behind the civil aviation program, the country began to see new and larger aircraft. Among these were the Argosy, with 3 engines of 375 hp. each, a 20-passenger plane with speed exceeding 100 mph; the Short 3-engine Calcutta Flying-boat, for the Empire routes, carrying 15 passengers at 100 mph., and others. The next three years saw improved instruments which made blind and night flying possible.

By the time Lindbergh, in his Atlantic flight, aroused the American people to the potentials of civil aviation, civilian passenger service in Britain had emerged from the reputation of dare-deviltry, and was recognized as a safe and necessary mode of travel.

Why the United States Passed Britain in Air Transport

Once awakened by the Lindbergh flight, however, the United States made rapid steps in the development of its own passenger service program. We know that today it has surpassed that of any other nation.

It will be noted that improvements were made in European aircraft between 1919 and 1928 in everything except speed. Speed in aircraft necessitated higher wing loadings and much improved airport conditions for both regular and emergency use, and also better aids to navigation.

Because of international differences in Europe, these were difficult or impossible to attain. There was no use, for example, for the British to improve their runways unless the French did, too. Such difficulties did not exist in America - and I believe this factor to be the chief reason why this country's civil air program advanced so rapidly.

In fact, quite contrary to meeting differences of opinion on airport construction - the United States gained speedily through a great wave of civic competition. Cities and communities developed a pride in their gateways to the air, and a contest to have the biggest and the best was on.

While early United States aircraft such as the Ford Tri-motor, the Boeing Tri-motor, etc., were about the same in performance as British planes, it is evident that the great stride in the world's civil aviation picture came when America went to work on improving her airports. When landing and take-off facilities were so greatly improved, faster and better planes were turned out.

America's golden opportunity to aid the program throughout the world, came during World War II. With her military planes winging out to all corners of the earth, she found it necessary to build or improve airports at all her aircraft destinations. Thus, today she has, in the construction of good airports, furthered the cause of civil flying in Europe, even though international confusion there STILL exists. This, in turn, has resulted in the production of larger and faster planes by aircraft companies in other countries, as well as the United States. Through air mail contracts, of course, America has government support, and through the building of good landing fields, greater speed has been made possible.

The history of domestic, or civil aviation, is a great story. Many, many phases or episodes could be related on this subject.

I have tried to inject some of the human aspect of the story by focusing my remarks on a group of British aircraft builders and RAF flyers who had an idea in which they believed; and how they held on to that idea through discouraging periods and circumstances when defeat seemed inevitable, until the world approved and adopted their idea -- for civilian air transportation.

WORLD WAR ONE AIRCRAFT DESIGNATIONS

(Continued from Page 8)

fore they could be used in order to avoid duplication. For statistical purposes, a code was adopted that designated various types as to crew, mission, and equipment, but this was not used in identifying individual aircraft. That was accomplished by means of the Marine Number, or serial number, painted on each side of the fuselage or hull. These numbers were assigned consecutively as the planes were ordered, and reached the 8000's by the end of the war.

Abbreviations of German Aircraft Manufacturers.

A. E. G.	Allgemeine Electricitats Gesellschaft
Ago	Ago Flugzeugwerke G. m. b. H.
Alb	Albatros Gesellschaft fur Flugzeugunternehmungen G. m. b. H.
Av	Automobile und Aviatik
Bay	Bayerische Flugzeugwerke A. G.
Daim	Daimler Motoren-Gesellschaft
D. F. W.	Deutsche Flugzeugwerke G. m. b. H.
Do	Zeppelinwerke Lindau (Dornier)
Eul	Euler-Werke
Fdh	Flugzeugbau Friedrichschafen G. m. b. H.
Fok	Fokker Flugzeugwerke G. m. b. H.
Germ	Germania Flugzeugewerke G. m. b. H.
Go	Gothaer Waggonfabrik A. G.
Halb	Halberstandter Flugzeugwerke G. m. b. H.
Han	Hannoversche Waggonfabrik A. G.
Hansa	Hanseatische Flugzeugwerke
Jfa	Junkers-Fokker Flugzeugwerke A. G.
Junk	Junkers Flugzeugwerke
Kon	Kondor Flugzeugwerke G. m. b. H.
Li	Linke Und Hoffman Werke A. G.
L. V. G.	Luft Verkehrs Gesellschaft m. b. H.
Mark	Markische Flugzeug-Werke G. m. b. H.
Mer	Mercur G. m. b. H.
O. A. W.	Oestdeutsche Albatros Werke (East German Albatros)
Ot	Otto - Werke G. m. b. H.

(Continued on Page 15.)

AN AIR DECADE IN FINE ART

by Eugene Clay

Every great national awakening has inevitably been recorded in fine art after sufficient time has elapsed to bring it into proper focus. Over a period of about two years in the late 1920's, every American community came into abrupt contact with aviation and accorded it a measure of support. Following the epochal flights of that time there came a rapid succession of foundings of airports, airlines and associations to forward the progress of aviation.

The necessity of recording this great national movement becomes increasingly evident as normal memory processes rapidly pass into oblivion. The "Air Decade", the ten-year span between the mid-1920's to '30's, was a dramatic progression from barnstorming to small airline to personal plane and ultimately to the large airline. It was a change unequaled by anything in the previous history of this country and the life of nearly every person was affected in some manner by this young science.

The typical scenes which colored that exciting epoch must be re-created in art while they still live in the hearts and memories of those who were intimately connected with them. It is not enough to have a heritage of newsreel and publicity photos of the heroes and record flights of the day. By the very nature of newsgathering, these records tend to preserve only the unusual and freakish and to ignore the typical and solid development which really took place.

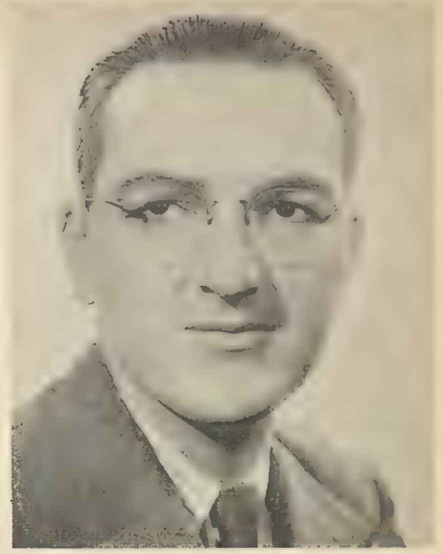
Thousands of homely little details make up the textures of which the airplanes and equipment of the day were composed. The artist, in portraying the patched engine cowls, the lumpy welds on the manifolds, the 'ring-wormed' fabrics and oily fuselage bellies, must do this with actual and loving feelings. Only one who has rigged the flying wires to tune on a Jenny, Eaglerock, or Stearman can give a true impression in painting.

The promotion of aviation which took place on the seventh day of the week kept it going during the lean years when barnstorming was a sideline to daily activity, and later when depression had hit everything. From the little airport, perhaps only an alfalfa field at the edge of town, came exciting smells of engine exhaust mingled with clover... and the revenues which paid the gasoline bill. The hand that paints these scenes should have canvassed the parked cars for dollar rides.

The human mind soon forgets the hours of discomfort and misery which all too often accompany the glorious and thiumphant hours. What more uncomfortable place on earth than an old open hangar facing the icy drafts of winter or the dust storms of summer? The hours of overhaul outweighed those spent in the air. And what hours these night overhauls entailed -- fumbling with stiff fingers for headbolts under the dim light of a greasy bulb, clawing moths out of one's hair. An artist should remember the despair of stripping the last stud in the crankcase at 3:00 A. M., having worked all night. He must also remember the wing dope's blushing in the damp night air or this tragedy will soon be forgotten. Some still have a deep impression of the eloquent blasphemy flung out upon the spring winds by the barnstormer as he wiped sand from the cylinders. These scenes were inimitable to those brief years when man, freed at last of his earth-bounds, began to put flying into everyday life.

The flying era of the barnstormer, airmail pilot and pioneer airline operator has earned immortality alongside our great-grandfathers' hard-won Clipper Ship trade routes, grandfathers' western rail conquest and fathers' automobile pioneering.

What accomplishment of man is more worthy to live in the fine arts than one which has changed the shape of the world?



Eugene Clay's childhood in Northern California and the colorful Apache country of New Mexico was a fine background for his desire for expression in creative art and design. Even with the limited facilities of small towns he won several competitions and one of his desert water paintings was chosen to hang at the San Francisco Exposition in 1939.

Clay studied art and engineering at Pomona College and was fortunate in having Thomas Beggs, now director of fine arts at the Smithsonian Institute, and the renowned Millard Sheets as his instructors and friends.

Eugene Clay is on the executive committee of the Madonna Art Festival, one of Southern California's important art competitions, and is chairman of the Sixth Bach Festival of Richard Ellsasser, world renowned organist.

THE FIRST DOUGLAS
(Continued from Page 6.)

in a Fokker T-2.

Donald Douglas had been working on designs for a torpedo plane while Eric Springer and Davis were preparing and attempting their flight, and had built the first DT, upon which Eric Springer conducted the test flights.

Despite the hard luck with the "Cloudster's" engine the plane had gained great fame and had proved out as an excellent design. Douglas' reputation was already good and the Navy gave him an order for three DT torpedo planes, which after considerable trouble in obtaining financing, were produced by the young company.

THE CLOUDSTER

First flight - 2/24/21

Engine - 400 hp Liberty

Span - 56 feet

Top speed - 120 mph.
Cruising speed - 100 mph.

Gross weight - approx. 10,000 lbs.

Editor's Note: Ryan Airlines, predecessor of Ryan Aeronautical Company, changed the Douglas "Cloudster" from an 8-passenger plane with three open cockpits to a single cabin accomodating 10 persons with a cockpit forward for pilot and co-pilot. This airplane was then used by Ryan Airlines on a run between San Diego and Los Angeles in 1925 and 1926.

WORLD WAR ONE
AIRCRAFT DESIGNATIONS
(Continued from Page 13.)

Pfal	Pfalz Flugzeugwerke G. m. b. H.
Rat	Waggonfabrik Jos. - Rathberger
Rin	Albert Rinne Flugzeugwerke
Rol	Luftfahrzeug Gesellschaft m. b. H. (Roland)
Ru	Rumpler Werke A. G.
Sab	Sablatnig Flugzeugbau G. m. b. H.
Schul	Luftfahrzeugbau Schutte-Lanz
Ssw	Siemens - Schuckert Werke G. m. b. H.
Staak	Zeppelin Werke Staaken G. m. b. H.

ALLEN F. KITCHEL JR. MODEL COLLECTION ACQUIRED BY MUSEUM

The Museum of the Institute of the Aeronautical Sciences has recently taken possession of an extremely interesting collection of aircraft models. This group, started in 1930, was constructed by Mr. Allen F. Kitchel Jr., of Old Greenwich, Conn., and is divided into two sections - World War I and World War II.

One of the real reasons why this group of miniature airplanes is of more than passing interest is the fact that they are much smaller than are usually built by the average modeller. Constructed for the most part in a scale of less than 3/16 in. to the foot, many of the tiny fighters are small enough to be placed on a package of cigarettes with room to spare.

At a period of time when many of those now engaged in various phases of aeronautics were still reading early copies of model airplane magazines, Mr. Kitchel decided to build a small model of Baron von Richtofen's famous Fokker Dr-1 triplane. This tiny model, no larger than 3 in. in wing span, became the first of the 142 planes that now comprise the entire collection. The triplane was followed by 48 other World War I types, which run the gamut from the early 1912 Rumpler-Etrich Taube to the 1919 Bristol All-metal Biplane Fighter. Other planes in this group show a clear cross-section of the history of aviation during World War I.

Great attention to detail has been paid by Mr. Kitchel, and the color schemes of his planes are most authentic throughout the collection. An interesting model is the Hanoveraner Scout of 1917, completely covered by the typical hexagonal camouflage of the Imperial German Air Force of that period. Among the more unusual models of this period are the Armstrong Whitworth Quadraplane Fighter, the Nieuport Triplane Scout of 1917 with its queer wing configuration, and the lesser known Fokker D-VI Biplane Scout of 1917, the forerunner of the famous Fokker D-VII.

The 94 models included in the Second World War series are equally as interesting as their predecessors, in that they also represent a complete cross section of the history of the air war during recent hostilities. The group of American aircraft is complete, and in many cases a whole set of models of one manufacturer has been this is the Grumman group that begins with the F-3-F-1 and goes through the F-8-F "Bearcat." The "Bearcat" measures 3 1/2 in. in wing span, which gives a fairly good idea of the scale in which these models appear. The smallest plane in the American group is the Stearman PT-13, while the largest is the Boeing B-29 "Superfort."

Miss Schneider displays comparative size of the model airplanes donated to the I.A.S. Museum.

In addition to the aircraft of the United States, planes of England, France, Japan, Italy, Germany, Russia, and Poland are represented. A model of the Russian I-16 "Rata" is only 2 1/2 in. in span.

The Institute is indeed fortunate in being able to acquire Mr. Kitchel's models, since they fill in many of the vacancies that have existed in the model collection of the Museum in the past. It is hoped that the readers of "Aeronautica" will visit the Museum while in New York so that they also may enjoy this unique model collection.

CATHERINE H. SCHNEIDER

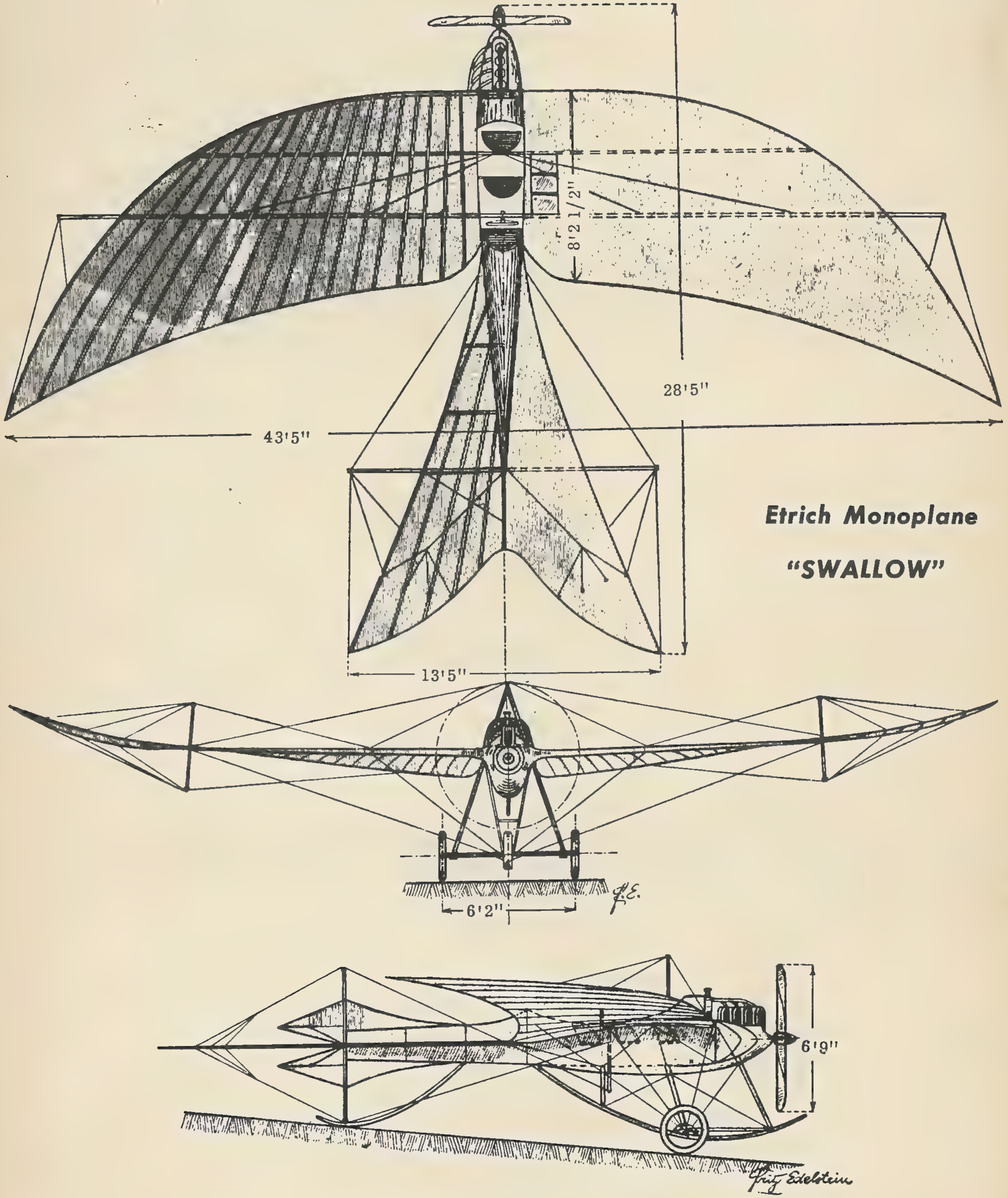
On October 16, 1952, Catherine H. Schneider was appointed Curator of the Museum of the Institute of Aeronautical Sciences. Miss Schneider came to the Institute from the American Museum of Natural History, where she had been working since 1945, associated with the Department of Exhibition and the Department of Forestry and General Botany.

Miss Schneider received her B.A. degree in History and Government from Adelphi College and has credits toward an M.A. at Columbia University in the Department of Anthropology.

Since coming to the Institute, Miss Schneider has been planning an exhibit for the Institute's annual meeting in January which will feature the recently acquired Allen F. Kitchel Jr. small-scale model collection. She is continuing the major calaloguing of the collection of the I.A.S. Archives. She also is considering ways and means of increasing the Museum attendance, particularly among school groups.

Etrich Monoplane

"SWALLOW"



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AERONAUTICA

Official Publication for Historical Associates

INSTITUTE OF THE AERONAUTICAL SCIENCES

Volume 5 JAN.-MARCH, 1953 Number 1

MONUMENTS IN THE HISTORY OF AVIATION - THE STUDY OF MEDALS

BY PAUL GUTT

Foreword

The collecting of aeronautical medals is a fascinating hobby, certainly as interesting as collecting the documents of air mail. That it is not as popular is due to the fact that so far no catalogue or handbook exists to guide the collector, who must acquire his knowledge solely through study of source material. As this situation limits the circle of collectors, it gives each one an opportunity for making discoveries and acquiring the rarest items for comparatively low prices. No doubt, as soon as a comprehensive handbook is published, collectors will turn up everywhere, and it will quickly be difficult to obtain the early material which dates back to the eighteenth century as far as actual human flight is concerned; including all the dreams and fantastic conceptions of human flight, the field reaches back two thousand years.

While working on a catalogue of all known coins and medals referring to flying, I received a letter from Mr. Paul Gutt, Hameln, Germany. He wrote that he was engaged in a similar project of cataloguing. In the course of this activity he has been building up an outstanding collection.

Mr. Gutt's interest in aviation dates back to 1911, when he was employed at a plant in Germany which manufactured hangars for dirigibles. In the same year he made his first flight in an airplane around the Eiffel Tower in Paris. Later he conducted an aviation school in Germany, which trained many of the best-known pioneers before the first World War.

I hope that Mr. Gutt's article will contribute to find new friends for this yet little known field.

Otto Kallir

Note: The accompanying article was translated from the German by Maurice H. Smith, former Librarian, I. A. S.

Ancient Coins

The old dream of humanity to overcome gravity is found in myths and traditions of ancient Greece from the days of antiquity. The subconscious longing finds its expression in the invention of fanciful images and is glorified in mythical tales in the form of winged men and fabled animals.

The most valuable documents in this respect are minted coins of Greece, which despite an age of approximately 2500 years, are often in a state of excellent preservation. The depictures all cumulate in the one great longing to be able to fly and to emulate the birds. This is of great informative value to aeronautical engineers since all flight attitudes, especially those of birds and of Pegasus have been patterned after nature with extraordinary perception.

Commemorative medals of later centuries show flying figures from Greek mythology, such as Daedalus and Icarus, the fall of Phaethon from the chariot of the sun of his father, the sun god Phoebus, etc. Since a very large percentage of the many thousands of Greek coins depict aspects of flight, only a few examples of such coins can be shown within the space available.

A stater of Crete gives the picture of the winged Talos. He was the son of Daedalus' sister and learned his art from Daedalus. Since he outdid his uncle in inventions such as the potter's wheel, the saw, and the lathe, jealousy prompted Daedalus to throw him from Athen's bastion.

Nike was the daughter of the Titan Pallas and Styx. As the bringer of victory, she was frequently shown with trophies of victory in conjunction with victory-bestowing deities. (This is from the Inselverlag Leipzig.)

There are numerous coins, showing the god of thunder and lightning with his combat flyer, the eagle; and this bird again together with his missile, the lightning, with or without wings. It was

(Continued on Page 3.)

First N.Y. - Phila. Historical Meeting

Capt. Barnaby Addresses Group

On Tuesday, March 24th, at 8:00 PM the first in a series of historical meetings was held at the Institute's building, 2 East 64th Street, New York City. Captain Ralph S. Barnaby, Head of the Aeronautics Section of the Franklin Institute Laboratories for Research and Development, was the speaker.

Captain Barnaby, long associated with gliding and the first man to be launched in a glider from a rigid airship, spoke on the gliding experiments conducted during the Fall of 1900 and the summer of 1901 by Wilbur and Orville Wright. His talk was supplemented with a series of slides of the Wright gliders, many of which had never been shown before.

Mr. S. Paul Johnston, as Chairman of the meeting, followed Captain Barnaby's talk with a short resume of the Historical Branch, Los Angeles Section, lending encouragement to the formation of an active group of Historical Associates in New York. There were 85 people present at this meeting, and another is planned for May 26th.

AERONAUTICA

Official Publication for Historical Associates

CONTENTS

Volume 5 **Number 1**

FEATURES

Monuments in the History of Aviation, by Paul Gutt 1
Developments of the Rotary Engine, by R. L. Bliss 4
P-64, by Harry Gann and John Sloan 6
Philadelphia--New York Joint Meeting 1
First Exhibit - Durand Museum 8
Aviation Mural 8

DEPARTMENTS

Editorial 2
Aerial Post 2
Courtney's Corner, by Frank T. Courtney 8

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EDITORIAL

Front page news is the announcement of the formation of the New York-Philadelphia group of Historical Associates into an Historical Branch. Among those present at the first meeting were several of the original HAMS who kept the HA grade of membership alive throughout the first year until the organization of the Historical Branch, Los Angeles Section. Best wishes to the new group.

It is the experience of most fraternal organizations such as this, that the "work" accomplished is entirely by volunteer effort. From the inception, one or several individuals sparkplug the entire group in directing its activities, arranging programs, caring for its records and archives, and buying the coffee and doughnuts. At committee meetings the one who speaks out is automatically given the assignment. In other words, someone has to call the signals, and that someone is usually the one who picks up the ball to run with it.

But this is a richly rewarding type of service. The committee heads, the elected officers, all find that the companionship with others of kindred interest far outweighs the extra hours spent each month in working for the organization.

Many have inquired about subscriptions for non-members. Yes, AERONAUTICA is available for non-members at the rate of $2.00 per year.

AERIAL POST

THE WHATSIT:

Sir: It is the first Wright copy of the Martin type of tractor biplane with a substitution of James V. Martin type of lateral control.

Capt. George Dunlap
Rt. 1, Lake Zurich, Illinois

Sir: Isn't it a WWI Avro Tandem Trainer? It is believed to have been "doctored" for air shows.

E. S. Smith
Dayton, Ohio

Sir: It is a Wright Model L, by Wright-Martin Co., with Wright 60 H. P. engine.

Wayne R. Wadington
Levittown, L. I., New York

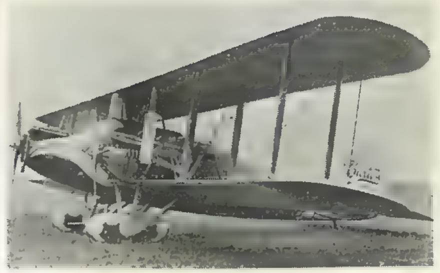
PSYCHOLOGICAL DIFFICULTIES:

Sir:...... There was one error in the "Tin Goose" story - (Aeronautica, July-Dec. '52). The original Tri-motor was destroyed by fire but not until Schroeder had gone through the preliminary test flights. They were successful. Schroeder and other pilots insisted that one could not fly an airplane without being able to feel the wind on his face. About this time, too, Tony Fokker had appeared in his three-motor plane with the engines below the wing.

Since the landing speed of the Tri-motor in its original state with the engines in the leading edge of the wing turned out to be almost 60 miles per hour, the Ford group decided that the engines should be down below to "help slow up the landing speed." There were no difficulties other than psychological with the plane in its original state.

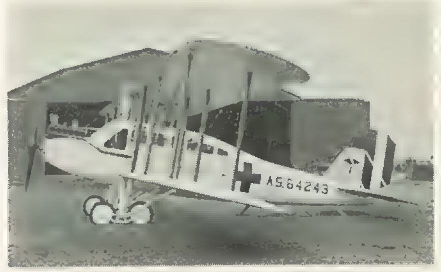
Wm. B. Stout
Phoenix, Arizona

EARLY TRANSPORTS:



Sir: In connection with early transports (Aeronautica, July-Dec. '52) the enclosed picture may be of some interest. The Curtiss Eagle --- flew in the fall of 1919, and it was, I believe, the first commercial multi-motored transport built and flown in this country, and probably in the world. It was started in the Spring and flown in the Fall, which indicates that it didn't take as long in those days to develop a transport as it does now. It was flown with three, two, and one engines, one of the few tested with such an arrangement.

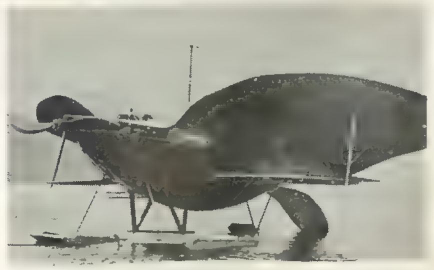
C. S. "Casey" Jones
La Guardia Airport



Ed. note: From the files of Curtiss Aeroplane & Motor Co. came this picture of the single-motored "Eagle" as an ambulance.

A WHATSIT

If any of our readers can identify this aircraft it is desired that all available information be forwarded to the editors.



NEXT ISSUE

Schneider Trophy Races, by Jack Canary; United States Aircraft Insignia, by Peter Bowers; Medals (continued) by Paul Gutt; The Hanriot Biplane, by Ed Maloney.

PHOTO CREDITS

Page 1, I. A. S. Page 2, Curtiss Aeroplane and Motor Co. Page 3, Paul Gutt. Page 6, North American Aviation, Albert U. Schmidt. Page 7, Wm. T. Larkins, Harry Gann. Page 8, Al Schmidt, Stan Raymond, Peter A. Juley & Son.

MEDALS Cont'd

Coined at the occasion of the Siege of Mayence in 1689. Phaethon is thrown from the sun chariot.

Talos. A stater of Crete, coined in 400-350 B.C.

the eagle's task to direct the lightning toward the intended victim and then to hurl it on the target. Disregarding for the moment the refinement of an electrical control of the predetermined flight path by a propellant, the basic idea reremains the same, namely, that of bringing an explosive charge to a point at a safe distance from the enemy and then destroying the target through the unaided flight of the missile itself. After all, what was the V-1 other than a winged lightning? It represents the realization of the idea of ancient Greece, found in so many variations on coins.

Decadrachmae, coined in Syracuse 413-375 B.C.

Slow-motion photographs have only recently shown the manner in which the flight of a bird comes about. The Greek artists were tireless in their observation of the flight of birds and depicted on staters of Corinth and Leucadia the individual images of slow-motion recordings on the wing movement during the flight of Pegasus, during take-off and landing.

In any case, a whole series of coins show that the ancient Greeks actually came to know the bird's flight, an indication of the intensity with which they studied the problem of flight.

Following are some medals depicting the transition from the Icarus flight to the beginnings of modern aviation. Only the very first successes and the peak performances of the individual types of flight will be discussed - those which most impressed man and which were commemorated on coins, medals, and plaquettes. These documents have a lasting value, as proved by the old Greek coins, and represent in their illustrative depictions the best monuments of their time.

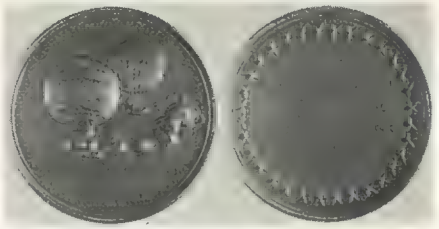
Daedalus of Athens was an Erechtide; his son was Icarus, the most artistically-inclined man of his time, architect and sculptor. Sentenced for murdering his nephew Talos, he escaped to Crete and was there given asylum by King Minos. On orders of the king, he built the celebrated labyrinth in which the monster, Minotaurus, was kept. The exile became a burden to him, and he constructed winged suits for himself and his son Icarus, using wax as a binder. After several trial flights, they decided to flee. During the flight, Icarus came too near the sun, as told in the myth, which melted the wax of his wings, and he fell into the sea. His body was washed ashore on an island which was named after him - Icaria. Daedalus landed in Sicily where he was received by King Kokaus for whom he created many artistic works until his death.

Daedalus fastens the wings to his son. France. Chalais-Mendon, 1885. Medal, S. Patey.

The basic idea of aviation was first realized in France toward the end of the 18th century. On June 5, 1783, the ascent of an aerostat (hot-air balloon) and on August 27, 1783, another ascent took place before King Louis XVI and 130, 000 spectators on Champ de Mars in Paris. To observe the behavior of living creatures a ram, a duck, and a cock were taken aloft. They landed later without mishap.

The first ascent of humans in a Montgolfier (this name was given to the hot-air balloons after their inventors, the brothers Montgolfier) was attempted by a pharmacist, Pilatre de Rozier, accompanied by the Marquis d'Arlandes. They flew over Paris and landed safely after a flight of 25 minutes.

The inventor of the gas balloon, Professor I. A. C. Charles, made the first ascent on December 1, 1783, together with M. N. Robert. As a scientist, he took readings of barometers and thermometers. The highest altitude reached was 3467 m. and the lowest temperature observed was 28 °F. below zero.



The Brothers Montgolfier. This medal, dedicated by King Louis XVI in 1784, documents the history-making beginnings of aviation.

Prof. A. Picard and Dr. Kipfer. The peak performance of a free balloon. Medal by Karl Goetz.

Sixteen kilometers along the surface of the earth are a rather mediocre achievement. To cover the same distance upward into the clouds, however, involves the risk of life and limb. The first ascent to this altitude, never before reached by man, took place on May 27, 1931. The scientist Professor Picard, born in Switzerland and making his home in Brussels, reached an altitude of 16, 000 m. with a balloon constructed (according to data by the world-famous Augsburg balloon-maker Riedinger) of gigantic dimensions.

Professor Picard used a hermetically-sealed aluminum hollow sphere as gondola, in which he and his companion, Dr. Kipfer, supplied not only their lungs but also their bodies with oxygen and otherwise protected their bodies from the negative pressure and the cold of the stratosphere.

This altitude flight was made for studying the radiation of radioactive substances, cosmic rays, and the atmospheric pressure which, at the altitude reached, was only one-tenth of the pressure at sea level.

On May 27, 1931, the start took place in Augsburg and the balloon landed in the Tyrol on a glacier near Obergurgel. The flight was to further science and to solve the problems encountered in aviation technique during long - distance flights in the stratosphere. The audacious fliers actually succeeded in this. The illustrative medal shows the start of the slack balloon in Augsburg.

In 1890, Otto Lilienthal published a book "Bird Flight as the Basis of Aviation." All later designs of airplanes and all present constructions were based on these principles.

The pioneer of French aviation, Flight Captain Ferber, expressed the significance of Lilienthal to humanity by the following remark, uninfluenced by the lack of understanding by his contemporaries: "The day on which Lilienthal covered his first 15 m. in the air is considered by me as the date from which humanity is able to fly."

Otto Lilienthal. Medal by Karl Goetz, Munich.

On August 9, 1896, Lilienthal tested a new elevator on his glider. He crashed from a height of 15 m. and was so seriously injured that he died the next day - leaving the following warning to later generations of fliers: "Sacrifices will be necessary."

(To be continued in next issue)

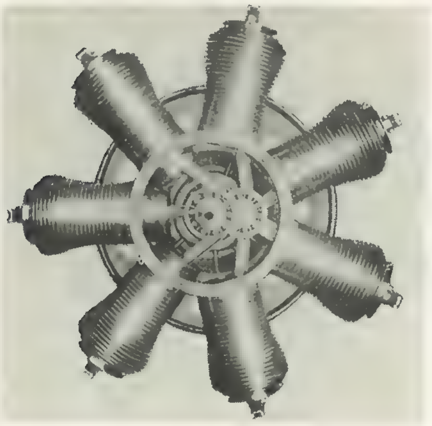
THE DEVELOPMENT OF THE ROTARY ENGINE

BY ROLAND L. BLISS

Ed. Note: Rolly Bliss, chairman of Los Angeles Historical Branch, presented a comprehensive paper on rotary engines at a recent meeting. This is a summary of his remarks.

At the first international air meet at Rheims in August 1909, an engine was introduced that gave France undisputed supremacy in the air. The engine was the 50 HP Gnome rotary. Its use made possible the shattering of all previous records for speed, distance, and altitude and enabled France to take away from the United States the leadership established by the Wrights.

Prior to 1909, the engines used by the Wrights and other pioneers were heavy, inefficient, and largely unreliable. Early experience with static air cooled engines was unsatisfactory. The Anzani engines used by Bleriot were converted motorcycle types, and lacking efficient cowling to provide the necessary pressure drop across the cylinders, overheated badly. It is interesting to note that if it had not been for a sudden rain squall that cooled his badly overheated engine, Bleriot could not have made his historic channel crossing.



Gnome "seven" with cam cover removed.

What was needed was a lightweight, reliable engine of nominal horsepower. Its lightweight, effective ground and air cooling, and simple carburetion and operation made possible advances in design that previously had been impossible. The life span of the rotary engine was short - a little over a decade - but its influence on airframe and engine design is still present in the modern radial engine powered airplane.

As in any design, the rotary engine was an effective compromise of good and bad features, and among the advantages were:

a. Low weight - in the order of 2.5 lb/HP - mainly by the elimination of the cooling system,plumbing, etc.

b. Fairly efficient cooling, entirely independent of the flight of the airplane.

c. Low frontal area and simple installation.

On the debit side of the ledger, its disadvantages were:

a. Limited efficiency - low rpm (1300 maximum).

b. Excessive fuel and oil consumption.

c. Losses due to air churning resistance.

In a discussion of rotary engines, a logical question seems to be why wasn't the static radial engine developed instead of the rotary, thereby eliminating all the apparent disadvantages of revolving cylinder operation. There are two answers to this question - cooling effects and weight.

Little was known during this period about cooling effects on static air cooled cylinders. Cooling was a problem not only in the air but particularly during ground running of the engine. The rotary engine provided efficient cooling independent of its motion through the air. The great disadvantage to the cooling effect gained in this manner was that almost ten percent of the effective horsepower of the engine was consumed in overcoming the air churning resistance created by the rotating mass.

The rotary engine was lighter than an equivalent static radial engine because of its design. In a rotary engine the crankshaft was stationary. The cylinders and propeller revolved around the axis of the crankshaft center, while the pistons rotated about the center of the crankpin. The cylinders and pistons then rotated in eccentric circles around the fixed crankshaft. The rotation of the cylinders was caused by the side pressure of the pistons on the barrels due to the obliquity of the connecting rods with the engine running. This resulted in more even distribution of forces than in a conventional engine where the piston loads are transmitted directly to the crankshaft and journals, thus allowing much lighter construction.

The Gnome Engine.

Historically, credit for the design of the rotary engine belongs to the United States and not to France. Records show this type of engine was originated by F. O. Farwell in 1896 and the first test application was to power an express wagon. Credit, however, for the first successful application of the rotary principle to an aircraft engine belongs to two men, Louis and Laurent Seguin, grandsons of the famous Marc Seguin, pioneer French engineer. It was in the latter part of 1907 that the Seguins and the Gnome Motor Company decided to build their first rotary aviation engine. The first tests with the new engine took place fifteen months after their research work began. The first engine was installed in a hydroplane at Monaco in 1909. This engine was used by Henri Farman in his airplane at Rheims. From this development came the first Gnome seven-cylinder engine developing 50 HP at a weight of 1.5 kg per HP.

Cylinders.

One of the major problems that faced Seguin in the design of the Gnome engine was the design of the cylinders. The centrifugal force created by the rotating mass of the engine tended to tear the cylinders from the crankcase. The problem of the centrifugal force on the cylinder of rotary engines was never entirely overcome, and there were many recorded instances where cylinders were thrown off in flight.

On the first engines, Seguin believed that the rotation of a smooth cylinder would provide sufficient cooling. The first engine ran without cooling ribs but heated up excessively. Aluminum cooling rings or fins were added to the steel cylinders, which improved the cooling effect. The aluminum rings proved to be fragile, however, and all subsequent engines had barrels with the cooling fins machined on. One of the principal reasons for the success of the Gnome engine was the excellent machine work.The cylinder of the seven-cylinder engine had a bore of 4.3 inches; the cylinders were machined down from a 96-pound billet to a 6.5-pound cylinder - the wall thickness being approximately 1/16 inch.

Carburetion.

The explosive mixture and the lubricating oil were admitted through the fixed hollow crankshaft, passed into the compression chamber through the valve in the piston, and the spent gases were expended through the mechanically operated exhaust valve in the cylinder head. The simple carburetor was fitted to the end of the crankshaft. Fuel from the fuel pump was admitted to the carburetor at 5 psi. A butterfly valve controlled the amount of air and fuel taken into the crank chamber. In tests conducted at the Gnome factory it was discovered that the engine would run without a carburetor with the gas line inserted into the end of the hollow crankshaft.

Lubrication.

Oil from the pump travelled under pressure through two tubes in the hollow crankshaft, and was ejected by centrifugal force through the web of the distributor case and through drilled passages in the crankpin. The excess oil always forced outward by the centrifugal force escaped through the intake valve and finally passed out through the exhaust valve. One of the greatest disadvantages of the engine was the oil consumption which resulted from the centrifugal distribution system. Oil consumption of the later Gnome engines was as high as 2.4 gallons per hour. Castor oil was used as a lubricant because it was not cut by the gasoline mist as ordinary mineral oil would be.

Louis and Laurent Seguin, designers of the Gnome Rotary.

Ignition.

The magneto for the ignition system was attached to the nonrotating plate to which the fixed crankshaft was attached and was driven by a pinion on the revolving crank chamber. Mounted on the end plate back of the driving pinion was the high-tension distributor plate and seven brass segments. Each segment was connected to the individual spark plug by uninsulated brass wires.

1912 Deperdussin with 160 H.P. Gnome 14 cylinder engine.

During 1909 through 1913 the Gnome engine company built several eight-cylinder engines and the power was increased to 80 HP. In 1910, two of the seven-cylinder engines were coupled together with a two-throw crankshaft to form a 14-cylinder rotary of approximately 100 HP. It was during this period that Paulhan, Pegoud, and Garros established all the principal worlds' records for speed, height and distance using the Gnome. During the Gordon Bennett Cup races of 1912, a remarkable airplane, the Deperdussin, designed by Becherau and flown by Jules Vedrines, established a speed record of 125 mph with a 160 HP Gnome engine. The Gnome engines of this period were identified by Greek letters such as Alpha, Omega, etc.

Gnome Monosoupape.

The early Gnome engines were not without design difficulties, among them being the inlet valve in the piston, which was a source of trouble and caused numerous fires. Efforts to get away from inlet valves in the pistons and to effect the intake of a fresh charge at the end of the intake stroke of the piston, while maintaining the four-cycle principle, were begun by the Gnome Company in 1911. In 1913, the best known of the Gnome engines, the Monosoupape or single-valve engine, was introduced. This engine differed from the previous engines in that a fairly rich mixture drawn in the crankcase was drawn into the cylinder through slits in the cylinder walls.

Monosoupape Carburetion.

In the Monosoupape engine there was no throttle valve; the fuel supply was controlled by a regulating valve to adjust the mixture strength. The only effective means of throttling the engine was a selector switch which could selectively short out one or more cylinders. Shorting of the magneto to stop the cylinders from firing was common practice in most rotaries; the shorting switch or "blipper" was located on the control stick. When the cylinders were shorted out, the mixture from the dead cylinders collected in the cowling, causing numerous fires.

Gnome Engine Installations.

In the early Gnome engine installations the engine was supported at both the front and the rear of the crankcase. This was undoubtedly due to a fear of nosing over and damaging the engine. In the later installations, the nonrotating engine support plate was bolted directly to an X-shaped engine mount. The end of the fixed crankshaft and carburetor was supported by a second supporting member in the fuselage. In a typical installation, the fuel and oil tanks were located aft of the fire wall above the engine. Air from the pump was pumped to the tank and, for starting, a hand air pump was provided.

Le Rhone Engines.

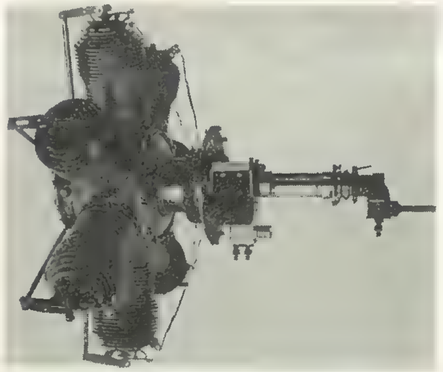
The Rhone engine was the work of a French engineer, Verdet, who, influenced by the Gnome designs, began work on the Rhone rotary designs in 1910. When the engine first appeared, it was known as the Verdet engine, and in 1912 the name Rhone was adopted. In 1914 the Gnome and Rhone companies were merged, forming the now famous Gnome Rhone Engine Co. The Rhone engine was generally considered to be an improvement over the Gnome engine, was more reliable and had a more efficient induction system and better carburetion.

In this engine the fuel-air mixture was directed to the intake valve by means of copper inlet pipes. Both the inlet and exhaust valves were located on valve cages in the cylinder head. By an ingenious arrangement using a walking beam type rocker arm, both the inlet and exhaust valve were operated by a single push rod which was operated by two male cams.

There were two principal types of Rhone rotaries developed - the Type 9C 80 HP and the Type 9J 110 HP. These were used extensively by the Allies in many combat types, such as the Nieuport, Caudron, Sopwith, etc.

Clerget.

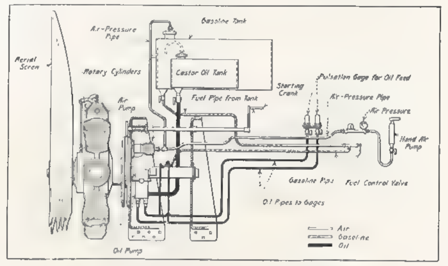
Pierre Clerget had been a designer of air-cooled engines for several years prior to the first war. Among his engines had been both in-line and radial air-cooled types. His first rotary appeared in 1912, and his later models were produced in large quantities for the Clerget Blin Co. The Clerget was the first to be equipped with aluminum pistons and featured dual push rods and an improved eccentric cam arrangement. Perhaps the best known of the Clerget engines was the Model 9-B 130 HP engine that was used in the Sopwith Camel.



"Baling wire" ignition and simple installation features are shown in this view.

Bentley.

During the course of the first war the British Admiralty contracted for a large number of Clerget engines. These British Navy engines were designated AR-1 and AR-2. In an effort to improve the engine, Capt. W. O. Bentley of the British Navy designed the Bentley engine. The Bentley engine was probably the most efficient rotary engine ever developed. It was also probably the last of the rotaries, because toward the end of the war the British concentrated on radial engine development with the ABC Dragonfly engine, on which huge sums were spent. The Bentley engine was similar in appearance and design to the Clerget. It was the first rotary to have aluminum cylinders with steel liners shrunk in. The last of the series, the B. R. 2, which was installed in the Sopwith Snipe, developed 250 HP in test runs at a weight of 2 lb/HP.



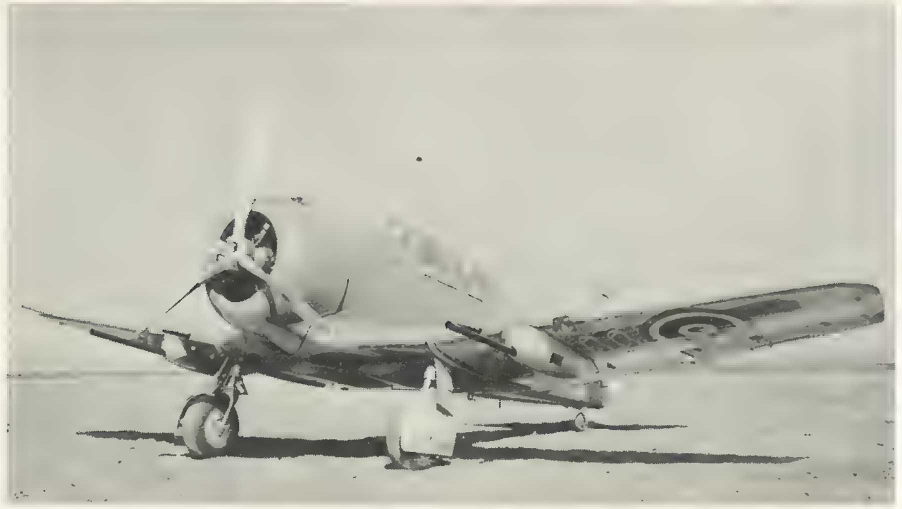
Typical Gnome installation.

Summary.

Any discussion of rotary engines cannot be complete without some consideration of a type of aircraft that was the direct result of the rotary engine development. Just as World War II saw the ultimate in the development of the piston-engine, low-wing fighter, so World War I designers evolved a configuration that produced the most highly maneuverable combat airplanes ever built, the rotary-powered fighting Scout or Chaser. This biplane Scout formula, which was to disappear with the introduction of all-metal construction and the cantilever monoplane, influenced fighter design for more than a decade after the war.

Two other factors that gave the rotary-powered Scout the advantage over the in-line engine types, were the low moment of inertia due to the grouping of the mass near the CG, which gave greater acceleration; and the reduced yawing and pitching aerodynamic moment as a result of the short nose. The terrific gyroscopic action of the rotary engine was another interesting phenomenon. This action produced a nose-down pitching moment during a right turn and a dangerous stall producing nose-up pitching moment in a left turn. During a right turn it required full left rudder to keep the nose up.

In summary, it may be stated that the rotary engine was difficult to start, consumed too much oil, and lacked flexibility. But in its day it provided a fairly efficient lightweight engine that was not available prior to its conception - and the rotary, for all its faults, made notable contributions to the advancement of aeronautical design.



NORTH AMERICAN'S

P-64

by

HARRY GANN

& JOHN SLOAN

The P-64 in its original colors as the NA-50A for Siam in 1941.

The photos on this page show one and the same airplane in five guises, a history unique. It is one of very few WW II fighter types still in service in civilian colors, the North American Aviation NA50-A, later known as the P-64.

The NA-50 design was begun in 1939 for Peru, which country ordered seven single place fighter airplanes. North American used its basic trainer design with foreshortened wings and fuselage, but in construction similar to the SNJ-1, BC-1A, BT-9D and AT-6. In project number assignment it preceded all these. The seven NA-50's were built in 1940 and delivered to Peru and only recently the last of them was retired from service.

When the "phony" war came to an end in France in 1940, airplane production was stepped up all over the world. Siam ordered from North American six single-place fighters known as the NA-50A, since they were refined versions of the NA-50, but inside NAA they were designated NA-68 for manufacture. The first one was flown by Test Pilot Louis Waite of NAA on September 1, 1940, and the project closed out, concurrent with shipment of the order to Siam, in June, 1941.

In developing the NA-50, North American used a steel tube forward fuselage section covered with all-metal removable access panels. The rear section was semi-monococque, tail surfaces were metal framework, fabric covered, and the wing was of typical NAA construction: all-metal center-section with removable outer wing panels and fabric covered ailerons. The outer wings were foreshortened five feet in span from a BC-1A wing.

The NA-50A, using the same lines as the NA-50, had various refinements in equipment location, four .303 cal. machine guns, two 20 mm. cannon, and an integral fuel tank in the center-section of the wing. Also the engine was an 875 hp. Wright R1820-GR100 "Cyclone."

The integral fuel tank was, at the time, a new innovation, first tried in the export NA-44 and in the first order of AT-6's. The entire center portion of the wing, between the front and rear spars, and between the outer wing panel joints, was sealed off to carry fuel.

In 1940 the use of so-called cannon, or large bore machine guns, was highly experimental. The P-39, some models of the Spitfire and the Hurricane and the Messerschmidt had large-bore guns but then, even as now, the .30 and .50 caliber machine guns were more dependable. However, an installation of Madsen 20 mm. guns, one in a pod under each wing with 100 rounds for each gun, was made in a very neat arrangement. The cannon were not delivered to North American up to the time of shipment, so they were never actually tried out. Thus the "Broomstick cannon" had much in common with certain other armies of that period.

Specifications and Performance

Span	37' 4"
Length	27' 11"
Height	11' 11"
Weight empty	4,647 pounds
Normal gross weight	5,990 pounds
Maximum overload weight	7,039 pounds
Wing load	35 pounds / sq. ft.
Power load	7 pounds / hp.

Top speed at sea level	245 mph
Top speed at 10,000 ft.	281 mph
Landing speed	71 mph
Climb to 10,000 ft.	4.2 min.
Service ceiling	32,000 ft.
Range at 62.5% hp.	710 miles

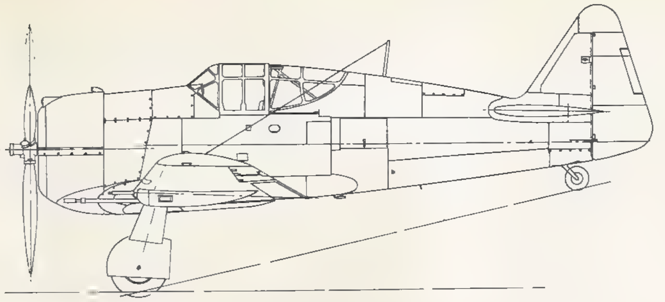
SERVICE HISTORY

43 70

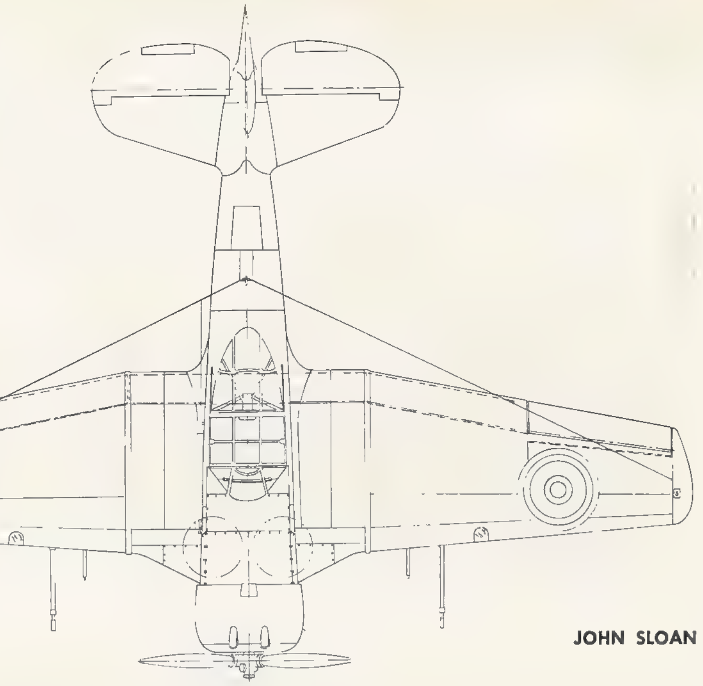
Six NA-50A's began their journey toward Siam in the latter part of 1941 and were in Honolulu on Dec. 7, 1941. When Siam capitulated to the Japanese the property was siezed by the U.S. Government and eventually returned to the mainland. All six were assigned to the West Coast Training Command of the Army Air Forces at Santa Ana California, and, after assembly, were flown to Luke Field, Arizona. Here they were used as advanced fighter training airplanes by both American and Chinese cadets. Within a few weeks two of them had been cracked up, and since the four left were such a small number to maintain as training machines, they were re-assigned to each of the four Training Command Headquarters, the Eastern, Southern, Central, and Western.

The airplane shown in Siamese national colors in the first picture is the same as in all of the rest of the photos. It was obtained by Col. Hoyt at the Santa Ana Headquarters in 1943 for his personal use. At that time Jack D. Canary was a North American Field Service Representative and, upon being approached by Col. Hoyt about an engine change, they together checked with the N.A.A.'s Stress Group on the feasibility of using an R1820-87 engine of 1200 hp. The airframe, it was learned, had been stressed for 2000 hp. so Col. Hoyt's ground crew made the engine change which resulted in slightly different cowling lines. Shortly after this Canary was transferred to the China-India Theatre and lost track of the airplane.

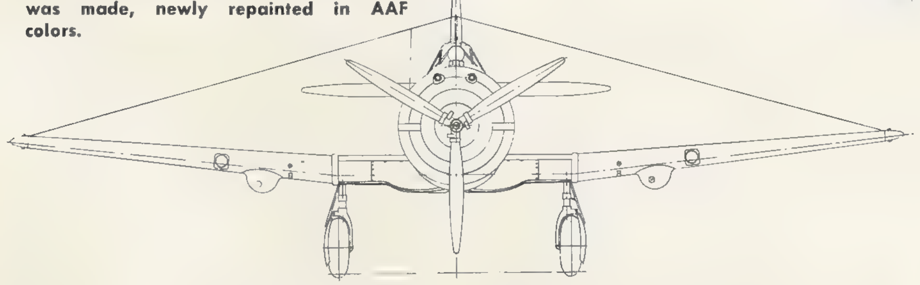
Jack Canary, Field Service Representative for NAA, saved this P-64 from the scrap heap.



The P-64 before the first engine change was made, newly repainted in AAF colors.



JOHN SLOAN



At War's end, Col. Hoyt was flying the airplane to Albuquerque, New Mexico for disposal by the War Assets Administration when engine trouble forced him down and he bellied in at Demming A.F.B. New Mexico. The base was still active at that time, and after a few weeks of repair, including a new propeller and belly cowling, the airplane was flown on to Albuquerque.

Jack Canary was in Albuquerque, in search of T-6 trainers for modification by North American when he spied it in the line, waiting to be cut up for scrap. Prevailing upon the crew to spare the airplane temporarily, he rushed to the WAA office where he bought it for $800. Canary later went into business in Phoenix, Arizona, with a partner, Kenneth Slater, doing charter, maintenance and instruction work in the Fall of 1946. The P-64, now numbered NX37498, was painted red with black trim, and was used for publicity, stunt work, and on two separate occasions, as a mercy plane flying medical serum to a small town in northern Arizona.

Canary worked diligently on his new toy. He altered the carburetor air scoop to improve ram-air efficiency. A 24 volt electrical system was installed to improve starting, and an electrical boost pump was placed in the fuel system to improve high altitude performance. Canary stated that the airplane was easy to fly. Its top speed was about 300 mph., either straight and level or in a dive.

In 1949 the airplane was sold to Charles Barnes of Phoenix. Barnes was associated with the Precipitation Control Corporation and when that company secured a contract with the Mexican Light and Power Company for cloud seeding - rain making - the airplane was again sold, to that company. Barnes and Precipitation Control operated it and made further modifications. A Wright R1820-60 engine was installed to raise the service ceiling. A water spray mechanism and a dry ice shaving machine in the rear of the fuselage discharged ice particles into rain-bearing clouds. The discharge tubes may be seen in the photograph of the airplane --- named the "Barnstormer No. 3."

The NA-50A - P-64 is still being operated from Phoenix Airport and may be seen there when not off in some area of the West seeding clouds.

Left: The P-64 in 1946 as NX37498. Note dry-ice distribution tubes in aft fuselage. Right: In 1953 at XB-KUU.

COURTNEY'S CORNER

FRANK T. COURTNEY

FLYING THE BLERIOT

When one has flown modern four engined aircraft for several hundred hours, it is interesting to look back on flying the early Bleriot monoplane. Incidentally, it is rather hard to forget flying them.

The first one I flew was at Farnborough early in 1915 -- a single-seat old crock with a Gnome engine of alleged 50 h. p. (Its number was 1836, and I got into trouble enquiring of the Squadron Commander if that was its date of construction). Lieut. Keith-Davies, now active around the Royal Aero Club in London, sent me off on that flight and has probably not yet recovered from the horrible performance. The weather was rough, power was low, control was nominal, and that Bleriot knew a lot more about flying than I did. I got into two or three near-spins (the old-timers' "side-slip") a few feet up before finally getting around, landing right way up, and resuming breathing.

Shortly afterwards I was sent to Gosport for a "monoplane course" before going overseas on Moranes, and I did a lot of flying on various 50 h. p. single-seater and 80 h. p. two-seater Bleriots.

The relatively long and successful career of the Bleriots was due mainly to their excellent structural design, which, while very light, was also very simple and robust. Any aerodynamic superiority was probably strictly coincidental. Their worst feature by far was the lateral control; if you compare pictures of the Bleriot and the Morane you will see why. Control of both was by warping the wings; the Morane wing-tip was swept outwards at the trailing edge whereas that of the Bleriot was cut inwards. Consequently the Morane had a lot of area to warp and a good control wheras although the Bleriot tip shape was for 30 years onwards agreed to be the most efficient, its warping area was small and control was feeble. As a result, in rough air, your lateral control consisted principally of using the considerable wing-dihedral by skidding with the rudder. This wasn't ideal but like anything else, it was all right when you got used to it. Until you did, rough air was hectic.

The rudder looks pretty inadequate, but with the openwork fuselage and the relatively small span, it had little damping to contend with and was actually quite effective for that sort of flying. Elevator control was more than adequate. The pivoted-tip type was good enough, but the reflex-elevator type was excellent. It gave powerful nose-up pitching control, which enabled the two-seater to be flown easily without passenger or ballast in the rear seat.

The unique swivelling-wheel system of the landing gear (with the long shock-absorber travel) was without doubt a great safety factor and saved innumerable landing crashes in those days of unskilled pilots and poor fields. (It is just a matter of time before swivelling main wheels become "new" again; when this comes up it will doubtless be classified "Secret"). However, this arrangement was not an unmixed blessing. Wheel shimmy is not a modern problem, and a Bleriot landing gear could shake your insides out if it was not properly rigged. And if you ever started to bounce on rough ground (there was no snubbing action on the shock-absorbers) you were sometimes liable to strange changes of direction each time you hit.

F.T.C.

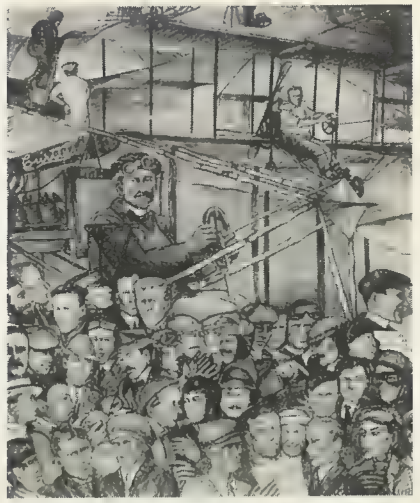
43 70

FIRST EXHIBIT IN THE DURAND MUSEUM

Mrs. Lucille Tindall, Sec'y at West'n Headquarters and Rolly Bliss, Chairman of Historical Branch, inspect first Durand Museum display.

The W. F. Durand Aeronautical Museum has now been established in the Los Angeles Building of the Institute of the Aeronautical Sciences. Since this year is the 50th anniversary of powered flight, the first exhibit in the Museum is devoted to honoring the Wright Brothers -- and their historic flight. Books used by the Wright Brothers, photographs, models, and other material relating to their work, are on display in the museum case. Under the auspices of the Durand Museum, a full-scale replica of the Wright airplane is being built through the cooperation of various aircraft companies. This replica of the 1903 Wright plane will be dedicated during the IAS Summer Meeting in July. An extensive collection of rare historical material has been placed in the Library of the Museum by E. W. Robischon, Manager of the Western Region of the IAS.

FUTURE OF AVIATION MURAL IN DOUBT



Close-up of Early Bird Section of Miss Aline Rhonie's aviation mural at Roosevelt Field, Mineola, New York.

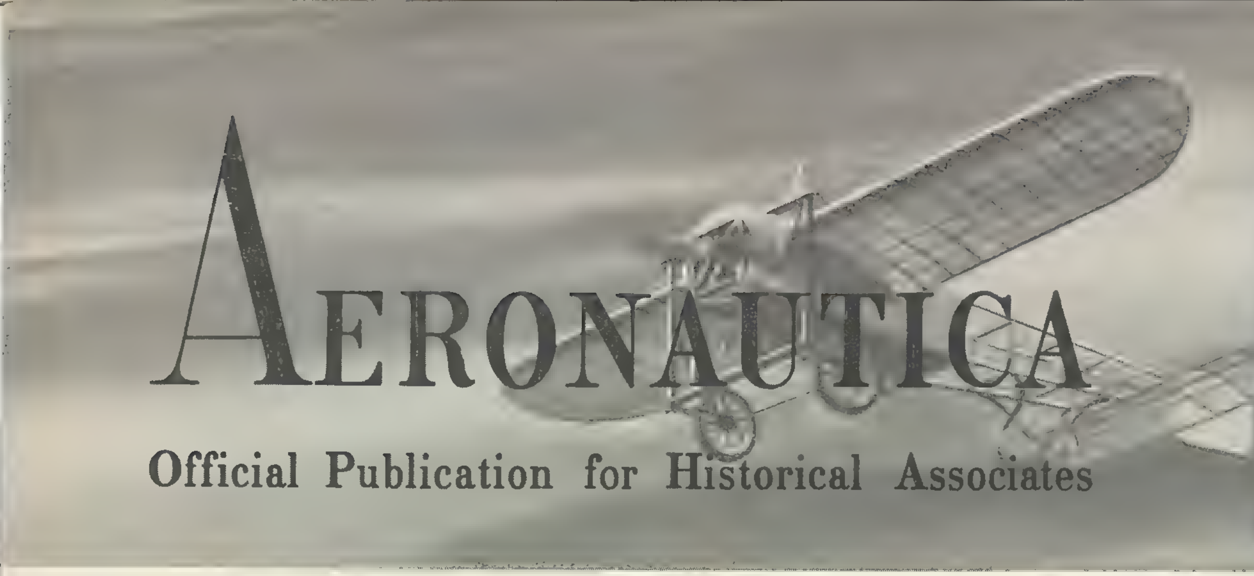
A valuable mural depicting local history of aviation on Long Island is seriously threatened by that nemesis of all airports, a housing project. The fresco mural, entitled "The Pre-Lindbergh Era of Flying on Long Island" is in Hangar "F" of Roosevelt Field, now occupied by a real estate firm, and the future of the building looks dim.

Miss Aline Rhonie of New York was the artist who designed and painted the mural, an undertaking which took from 1935 to 1938 to execute. It contains portraits of nearly 500 early aviators and illustrates the important aviation events prior to Lindbergh's flight. Many of these aviators are interested in the fate of the painting.

The mural is divided into seven sections, respectively entitled "Early Birds No. 1," "Early Birds No. 2," "Early Birds No. 3," "World War I Period," "Original Airmail," "Barnstorming," and "There's Money In It." The Early Birds' Sections include such personalities as the Wright Brothers, Glenn Curtiss, Santos Dumont and the first woman pilot, Bessica Raiche. World War I Section illustrates an assembly line at Curtiss Plant, class instruction at Mitchell Field and World War I aircraft. The Airmail Section shows the first airmail scheduled flights from Belmont Park. The mural culminates in Lindbergh's flight across the Atlantic in 1927. Many "firsts" are also illustrated.

Miss Rhonie obtained her commercial pilot's license in 1931, and has flown 130 different models of aircraft. During World War II, she took a very active part in organizing relief work and flying. She was one of the first group of women pilots to fly for Air Transport Command in 1942 as flight leader in the Women's Air Ferrying Service. In 1943 she joined the British Air Transport Auxiliary, ferrying for the RAF in the United Kingdom.

Miss Rhonie was well qualified to tackle a fresco the scope of the one at Roosevelt Field, for beside her aviation training, she studied painting for four years with John Sloan and fresco painting with Diego Rivera. New York was the scene of two showings of Miss Rhonie's paintings in 1938 and 1941.



AERONAUTICA

Official Publication for Historical Associates

INSTITUTE OF THE AERONAUTICAL SCIENCES
Thomas P. Faulconer
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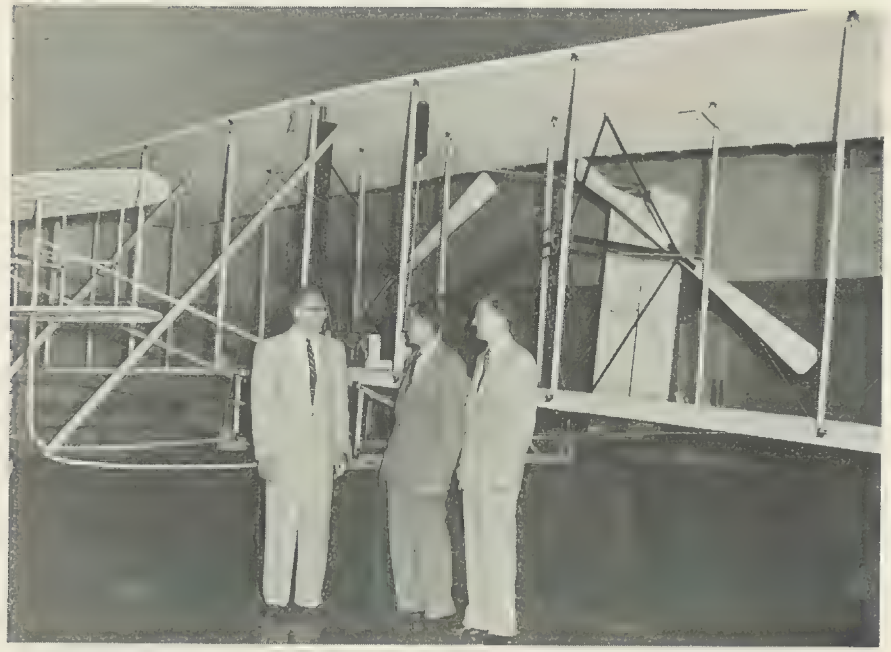
Volume 5 APRIL-JUNE, 1953 Number 2



E. W. Robischon, Western Region Manager of the I.A.S. with Hal Luskin and Al Cleveland, L.A. Section officers, who spark-plugged the building of the Wright Replica.

WRIGHT REPLICA UNVEILED

Now on permanent display in the auditorium of the IAS Western Headquarters is an exact replica, except for the dummy engine, of the Wright Brothers' first powered aircraft. First unveiled to the public by James H. Doolittle at the Annual Summer Meeting of the IAS in the Statler Hotel at Los Angeles, this replica is the only full-scale reproduction of the original plane in existence in this country.

E. W. Robischon, Manager of the Western Region of the IAS, is credited with conceiving the idea for cooperative construction of the Replica as a tribute to the Fiftieth Anniversary observance. As Director of the Durand Museum, he implemented the idea by obtaining the cooperation of manufacturers, schools, and other organizations in supplying the materials and components for the Replica. Coordination of the project was directed by F. A. Cleveland of the Los Angeles Section of the IAS. Historical Associates of the IAS were helpful in confirming historical data. Much data and drawings were obtained during the construction period from the Smithsonian Institution in Washington where the original aircraft is on display. Drawings were also provided by the Kensington Science Museum in England, where the only other replica of the Wright plane is located.

Outstanding among contributors to the project were the Northrop Aeronautical Institute and the Marquardt Aircraft Co. Students of the Northrop Institute, working under the direction of Ralph Bent, Mechanics Training Director, fabricated the complete wing panels and performed all final assembly and rigging following completion of components by other contributors. Employees of the Marquardt Company built the complete wood and metal engine mockup in their own time.

East Coast H.A.'s Hear Chamberlin

On May 26, at the IAS Building in New York, Mr. Clarence D. Chamberlin was the guest speaker at the second in a series of interesting historical meetings. Mr. Chamberlin gave his audience a delightful two hours with his personal reminiscences of the flight he and Mr. Charles Levine made to Germany in 1927. He also told of his first solo flight and of the new record set for continuous flight over New York with Mr. Bert Acosta in May, 1927.

The events leading up to the trans-Atlantic flight in the famous "Columbia" were discouraging. Up until the last minute, weather conditions were doubtful. Finally, however, on June 4, 1927, at 4 a.m., Chamberlin and Levine climbed aboard, took off, and landed two days later near Eisleben, Germany, setting a world record that stood for some years. Mr. Chamberlin discussed his relationships with many of the personalities connected with the trans-Atlantic flights at Roosevelt Field, such as Bernt Balchen, Dr. James Kimball, Guiseppe Bellanca, and Lloyd Bertaud.

Mr. Chamberlin supplemented his talk with photographs and a film which illustrated not only his flight but also the flights of others, including Lindbergh.

AERONAUTICA

Official Publication for Historical Associates

CONTENTS

Volume 5
Number 2

FEATURES

Wright Replica Unveiled........ 1
East Coast H. A.'s Hear Chamberlin........ 1
Monuments in the History of Aviation - Part Two........ 3
U. S. National Insignia........ 4
The Birth of Speed - The Schneider Trophy Races........ 5
The Hanriot That Was Nungesser's........ 7

DEPARTMENTS

Editorial........ 2
Aerial Post........ 2
Courtney's Corner, by Frank T. Courtney........ 8

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EDITORIAL

This is a request for information. AERONAUTICA would like to be able to pass on to its readers a scientifically prepared summary of the practical means of preservation of historical material, such as how to store airplane wings, a wooden propeller, a delicate scale model, or airplane photographs.

The preservation of the documentary evidence of past historical deeds was never a subject for intense scientific study until modern times. The Pharaohs, Athenians, Romans, and the cathedral builders of the Renaissance were able to leave their marks in stone which has lasted these hundreds of years, but in the field of aeronautical history (an infant in comparison of time) the material evidence of man's achievements has been more fleeting. Few relics of aviation history exist outside the National Museum, and the nature of the materials used in these assures their destruction in time.

Hence, if our member collectors could know how to prepare books, documents, photographs, models, etc. for not only the everyday use they endure but also for all time, posterity may yet have something to look at. A bibliography on this subject is now in preparation and will be published in a future issue. However, since most of the material is for professional use, suggestions from readers on simplified techniques applicable to the individual collector would be appreciated.

AERIAL POST

ANTIQUES EXTANT:

Sir: Here is a list of early airplanes in private possession that I have been able to dig up recently. Hope your readers can add to it:

- Curtiss owned by Capt. Bullock, Northwest Airlines, 1885 University Ave. St. Paul, Minn.
- Bleriot 1909 in New York being restored to flying shape.
- Billy Parker's Curtiss Pusher, Phillips Petroleum Corp. Bartlesville, Okla.
- Art Hartman, Burlington, Iowa (Early Bird). Homemade 1910 revisions up to 1921; flyable.

E. D. Weeks
The Armand Co.
120 Des Moines St.
Des Moines, Iowa

P-64's IN ERROR:

Sir: The P-64 article was wrong in stating that the P-64's were in Honolulu at the time of Pearl Harbor. I photographed one, the photo which you published, at Moffett Field on 6 Dec. 1941.

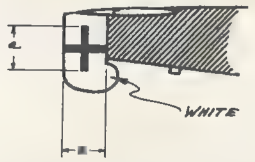
Wm. T. Larkins
175 Clarie Drive
Concord, Calif.

PHOTO CREDITS

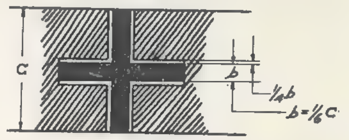
Page 1, I. A. S. Page 3, Paul Gutt. Page 4, Peter M. Bowers. Page 5, Flight Magazine. Page 7, Peter M. Bowers. Page 8, Ed Maloney, Joe Nieto.

GERMAN AIRCRAFT INSIGNIA:

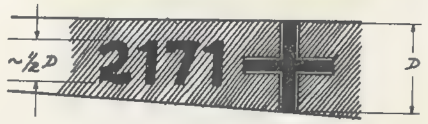
Sir: To complete the designation picture, enclosed please find a drawing showing the official regulations regarding the application of insignia to German seaplanes, circa October, 1918. I believe that this is the first information ever printed showing how the Maltese Cross is proportioned. This information comes from "Deckblatter Nr. 1 bis 27 zu den Algemeinen Baubestimmungen fur Seeflugzeuge der Kaiserlichen Marine," October 1918. I include this so that the many collectors can keep their eyes open for these sheets, of which I found only one page in Europe. Perhaps more pages exist somewhere, deep in the files of some forgotten section in a library.



1. CROSS AS APPLIED TO RUDDER



2. CROSS AS APPLIED TO WING
C = LENGTH OF CHORD



3. MARINE NUMBER AND CROSS AS APPLIED TO SIDE OF FUSELAGE

IDENTIFICATION INSIGNIA FOR GERMAN NAVAL AIRCRAFT, OCT. 1918

The "L" designation was also used by itself for designation purposes. The only example of an "L" type built was the Siemens-Schuchert LI. It was a type that came between the smaller "G" (Bomber) types and the larger "R" (Giant planes) types. The "L" incidentally stood for "Lastenflugzeug" (Load carrying plane). For reference and photos see "Flugsport" 1920 page 477.

Peter M. Grosz
Princeton, N. J.

TRADER'S COLUMN

WANTED: Photos and information on Helicopters and rotating wing aircraft. HAVE DeHavilland Gazettes for sale or trade. Warren D. Shipp, 812 Crown St., Brooklyn 13, N. Y.

FOR SALE: Aircraft Yearbooks, 1919 through 1937, in excellent condition, many still in jackets (incl. 1919). Sell all or part. Jane Louise Fitz-Simons, 2522 Cornaga Ave. Far Rockaway, N. Y.

IN FUTURE ISSUES

Schneider Trophy Races, Part II, by Jack Canary; The Wright Brothers' Gliding Experiments in 1911, by Captain Ralph Barnaby.

MONUMENTS IN THE HISTORY OF AVIATION

PART TWO

THE STUDY OF MEDALS

BY PAUL GUTT

Chalais-Meudon was the site of the First Dirigible Battalion. The same garrison produced the two captains who were the first to make a successful flight in an airship in which the original take-off field was again reached. Renard and Krebs were the fortunate aeronauts who utilized the practicable ideas in the designs of their predecessors who had not been entirely successful. They were assisted greatly by the Dupuy de Lome principles. The 8. 5 hp engine and the propeller were furnished by the brothers Tissandier, whereas the airframe was patterned after the Haenlein balloon as far as size and shape were concerned. The airship, baptized "La France," made its memorable maiden flight on August 9, 1884, in which controllability in all directions in space was obtained. This was the first solution of the problem of dirigibles, given by a round trip of 20 minutes duration. This flight was followed by two additional sensational flights from Chalais to Paris. The medal shows the outer shape of the dirigible. The following medal by Karl Goetz commemorates the flight of the Graf Zeppelin around the world in 1929.

On December 17, 1903, the news spread in the United States that two brothers Wright had made a successful ascent in an aircraft. The prophets were not recognized in their own country, their success was not taken seriously, and they were called the "lying" instead of the "flying" brothers. But in 1909 Congress had this plaquette struck in belated recognition of their work.

One side of the above medal shows Friedthiof Nansen who led a North-Pole expedition in 1893-96 on his ship, the "Fran Christinia." His highly interesting book "Farthest North" may have induced Andree to explore by balloon the pole which had not been reached by Nansen. The reverse of the medal shows the portrait of Andree and the balloon with the tow cables. By weighting the towing cables with skids, the balloon was given a certain drag on the snow and ice. Sails attached to the balloon permitted some deviations from the direction of the wind, up to 27°, as proved by systematic test flights.

Nevertheless, the undertaking was extremely hazardous. Even if he reached the Pole, there was still the return march on foot with a load of three sleds, fully packed with supplies, tents, pneumatic rafts, and numerous paraphernalia required by such an expedition.

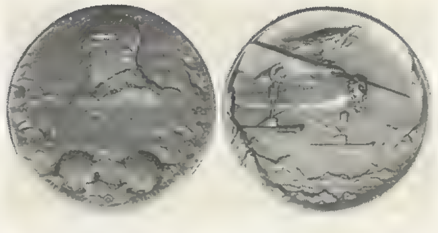
On June 7, 1896, he left his home in Norway. The balloon "Eagle" with Andree, Fraenkel, and Strindberg was released in the ice fields at 17:46 o'clock, starting immediately with an unfortunate mishap. A sailor just managed to warn the aeronauts that the towing cables were left behind. It was too late; Andree not only lost control over the balloon but also had to do without the additional 530 kg ballast.

The last news of the daring enterprise was brought back by a homing pigeon, and was written by Strindberg: "13 July 12:30 p.m., 82° 2' latitude, 13° 5', satisfactory trip; direction East 10' South; all well on board."

It almost sounds like a fairy tale that a Norwegian expedition "Brotwaag" 33 years later accidentally discovered the well-preserved bodies and the complete diaries of all three participants on the southwest tip of Vitoe east of Spitzbergen, giving all details of the expedition itself. The bodies of these three heroic men, frozen in the eternal ice, were put to rest in the soil of their native land after 33 years.

Despite the fact that both Poles had been discovered by sled expeditions, the North Pole by Peary and the South Pole by Amundsen, the exploration of the Poles by air was an original undertaking which promised extensive research data from such a higher viewpoint, documented by aerial photographs taken of large districts around the Poles.

The industrialist, Henry Ford, and his friends equipped Byrd with the necessary outfit for the North-Pole expedition. As a vehicle a three-engine Fokker high-wing monoplane with runners was selected. The co-pilot was the able navigator, Floyd Bennett.



Their ship entered King's Bay on Spitzbergen on 29 April, 1926, and the take-off took place on 9 May at 12:30 a.m. For hours, they flew over the interminable stretches of the pack ice and open water channels, filling every minute with taking fixes by sun and magnetic compass (considering that the magnetic pole is 1000 km away from the geographic pole), taking numerous photographs, and making visual observations.

At 9:02 a.m., after 8 hours and 32 minutes, they proudly flew over the Pole, which was only an open water channel. They made accurate surveys at this point for a full 30 minutes. Where others used weeks and months to obtain only partial results, they accomplished the same in a few hours and even surveyed a much larger area.

Jean Baptiste Oliver Garnerin, a physicist by profession, was the designer of balloons and parachutes. The younger brother, Andre Jacques Garnerin, applied the theoretical ideas of Oliver to practical use, dared use the designs of the older brother and made the balloon ascent and parachute jumps. These brothers are the most courageous pioneers of aviation who developed that life-saving equipment of aviation, the parachute, and brought it almost to the present state of completion as far as most structural details are concerned by actual jumping tests.

The first jump was made on October 22, 1797, over the Parc of Monceau from a height of 1000 m and was partly involuntary, since the balloon burst at this altitude. A medal was struck in 1803 by Loos, in Berlin, commemorating the event.

The last medal shown here commemorates the success and immense sacrifice in material and life of the heroic American and British airmen who saved the Berlin populace from cruel cold and hunger in 1948 by the Berlin Airlift. Though still fresh in memory it was created as a monument for the future in recognition of their feats.

THE U. S. NATIONAL INSIGNIA

BY PETER M. BOWERS

An early Curtiss N.9 displaying the blue anchor used by Naval aircraft in 1915 and '16.

It was not until late in 1915 that the U.S. armed services took steps to distinguish military aircraft from civilian types as the result of action on the Mexican border. At that time, army aircraft had a red five-pointed star painted on each side of the rudder, and navy planes had a blue anchor painted on each side of the rudder and sometimes under the wings.

In May, 1917, a month after the U.S. joined the Allies, a new marking was adopted for aircraft of both services. This was a white star superimposed on a blue circle, with a red circle in the center tangent to the inner projections of the points of the stars. This marking was used on the wings only, and for the first year of its use, was carried inboard of the ailerons. The rudder was divided into three vertical stripes, with red at the trailing edge, then white, then blue.

In January, 1918, the marking was changed again, this time to a tricolor circle to conform to the circular markings used by the other Allies. The former Imperial Russian marking was used, with red on the outside, then blue, and a white center. The order of the tailstripes was reversed, blue now being at the trailing edge. For a few months, some ships delivered to the A.E.F. by the French carried the stripes in the order of red at the trailing edge, then blue, and then white, but this was not standard.

In the United States, many 1917 airplanes continued to carry the star while new or repainted models used the circles, and it was not unusual to see a plane with one marking fitted with a spare wing carrying the other. During the war, very few U.S. aircraft carried the insignia on the side of the fuselage, the few that did being British types that merely had the original British markings painted over in the new color arrangement. In this case, the white outlining ring used by the R.A.F. was retained. On European designs, the insignia was carried at the wingtips, and late in the war, U.S. production types began to carry it one diameter inboard from the tip. This has been a pretty general rule for location ever since, although during the early 1920's many ships carried the marking right at the tip, while others, mostly Navy, carried it inboard of the ailerons again.

After the war, the star was readopted, and the tailstripes were returned to their original order, although some ships carried the wartime markings as late as 1923. No further changes were made until late in 1926, when the Army adopted a new tail marking, a single vertical blue stripe, one-third the chord of the rudder, with thirteen alternate red and white horizontal stripes between it and the trailing edge. This marking had been proposed by C. N. Monteith of the Boeing Airplane Company, and was tried out on Boeing ships before its official adoption in November, 1926.

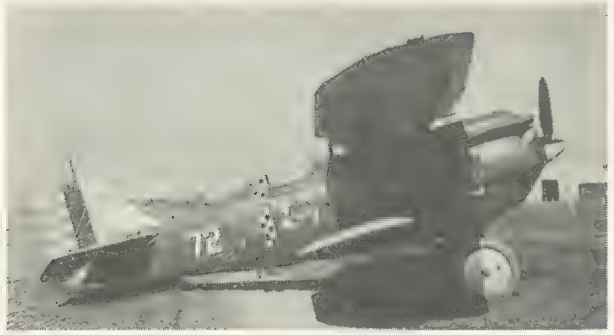
Navy use of the vertical tail stripes began to decrease at this time, many aircraft operating with the fleet doing away with them entirely in favor of solid colors on the whole empennage which were used to identify the planes as to ship or station. By 1940, only Marine Corps planes and some Navy trainer and utility types were still using the vertical stripes.

In 1930, aircraft of the Coast Guard expanded the vertical tail stripes to include the entire fin and rudder, and in 1935 adopted a new marking of its own, a solid blue area at the top of the rudder with five red and white vertical stripes below it. This remained in use until the adoption of camouflage in 1941. Coast Guard planes did not use the star insignia at all until after Pearl Harbor but have used it ever since.

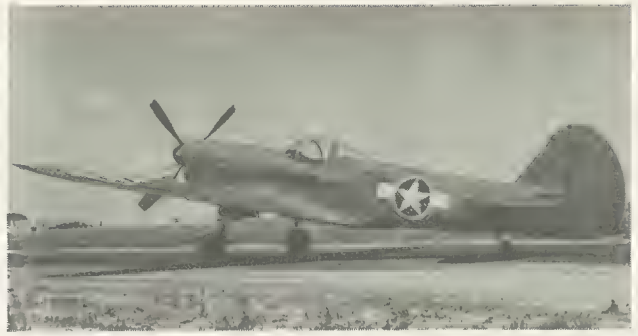
In March, 1941, camouflage was adopted for combat types of all services. This did away with tail stripes entirely, and added stars to each side of the fuselage. One star was removed from each wing, leaving them only on the lower right and upper left panels. The exception to this was the Curtiss P-40, which left the factory in 1940 with camouflage and the old markings. P-40B's and on were delivered with the change incorporated, and the old models were repainted in service. Immediately after Pearl Harbor, Navy, Marine, and Coast Guard aircraft made further changes, replacing the stars on both wings, often as large as the chord would permit, and adding thirteen horizontal red and white stripes to the rudder.

These markings were in use until June, 1942, when the horizontal stripes were abandoned by all aircraft, including the few uncamouflaged Army types that had continued to use them. The star insignia itself was changed this time, the red center being eliminated because of similarity to the Japanese "Meatball." At this time, the Army was still using only one star to a wing on camouflaged types and the Navy was using two. During the following year, this was standardized at one to a wing for all types, camouflaged or not, and remains so today.

In late 1942 and part of 1943, U. S types operating in Europe and Africa accented the insignia by surrounding it with a white or yellow ring to improve its visibility. Just the opposite was done on some night bombers, the white of the star being changed to a light gray to reduce visibility. The next change came in July, 1943, when two white rectangles, each equal in length to the radius of the basic blue circle and half the width, were added to each side of the circle, with the tops of the rectangles in line with the tops of the side points of the stars. The whole arrangement was then surrounded by a red border one-eighth the diameter of the circle in width. After three months, the red border was changed to blue, and remains so today, only one further change having been made since. In January, 1947, a red stripe was centered on the long dimension of the white rectangles, giving the insignia the full National Colors for the first time in four years.



Curtiss P-6D showing the horizontal tail stripes used by Army Air Service and Air Corps from November 1926 to June 1942.



Curtiss XP-40Q with white rectangle and red border added to the insignia in July 1943.

THE BIRTH OF SPEED

THE SCHNEIDER TROPHY RACES

BY JACK D. CANARY

The Schneider Trophy, now on display in the lobby of the Royal Aero Club in London.

As the year 1912 drew to a close the new science of powered flight had in its first decade achieved amazing strides. From a faltering 31 mph of the Wright brothers' biplane at Kitty Hawk on Dec. 17, 1903, a French airman by the name of Vedrines had flown a Deperdussin monoplane at the amazing speed of 108.2 mph. The first international aviation meet for hydro-planes had been held at Monaco, France, and great interest in the seaplane as a practical flying machine had been developed internationally.

At the Gordon Bennett Banquet of the Aero Club of France, held in Paris on Dec. 5th, 1912, it was announced that Jacques Schneider, one of the guests, had donated a trophy valued at 25,000 francs for an International competition to be called the "Coupe d'Aviation Maritime Jacques Schneider." A well-known sportsman, Schneider was a relative of the founder of the Schneider-Creuzot concern and had been captivated by the display at the Monaco meet. His nationalistic pride aroused by the feat of Fischer, a German, flying a Farman seaplane at the 1912 event and winning the entire contest with ease perhaps may have prompted Schneider to make this offer. He also stipulated that a further 25,000 francs would be awarded to the promoting club for winning three consecutive contests, the first of which was to be held under the auspices of the Aero Club of France. Small wonder then that the coming 1913 meet, also to be held at Monaco, was eagerly looked forward to by airmen the world over.

THE FIRST SCHNEIDER TROPHY CONTEST was the last event on a crowded program of competitions at Monaco. The rules of the contest required a preliminary sea-worthiness trial to ensure that the competing seaplanes were not just racing freaks, but reasonably seaworthy craft capable of operating in normal weather conditions. Flying a two-lap course each contestant was required to land at each half lap and cover 500 metres in contact with the water. The only French competitors were Marcel Prevost (Deperdussin), Roland Garros (Morane), and Espanet (Nieuport) and they finished their trials in that order. The only other entrant was Charles T. Weymann, an American, flying a Nieuport. These trials were held on Friday, April 12, and on the following Tuesday, April 16, 1913, the actual race was held.

Prevost was the first away at five minutes past eight and he was followed by Garros 14 minutes later, while Espanet started at 8:50 and Weymann at 9:14. The course, 28 laps of 10 kilometers each for a total of 150 nautical miles was a gruelling test for these frail machines. Garros had difficulty in becoming airborne in his Morane and after damaging one float retired from the race. Espanet in his Nieuport had great success with his stepped floats and demonstrated a very seaworthy craft. Unfortunately, he had the misfortune to break an oil line and had to retire after only one lap had been completed. This left Prevost in his Deperdussin and Weymann to fight it out. It was apparent from Weymann's time at the end of 200 kilometers that he had a slight speed advantage over Prevost and it was with much relief that members of the Aero Club of France along the course saw Weymann alight after his 20th lap because of engine trouble. This was a heartbreaking climax to Weymann's struggle to keep the United States represented in this first International Seaplane Contest. Marcel Prevost continued on to win the Trophy outright for the Aero Club of France in his Deperdussin twin-float monoplane fitted with a 160 hp Gnome engine. Prevost completed the course in 2 hours, 50 minutes, 47 seconds, but in finishing he omitted to cross the line, and by the time he could get into the air again and cross the line considerable time had been lost. His official time then became 3 hours, 48 minutes, and 22 seconds, which brought his average speed down to 45.75 mph.

THE SECOND SCHNEIDER TROPHY CONTEST was entrusted to the Aero Club of France and again held at Monaco on the French Riviera. The course was again one of 28 laps of a 10 kilometer circuit and five countries entered machines for the contest. On Sunday, April 19, 1914, the following entries lined up for the preliminary trials:

Howard Pixton (GB) Sopwith "Tabloid"
100 hp Gnome Rotary engine.
Lord Carbery (GB) Morane Saulnier
80 hp Rhone Rotary engine.
Espanet (French) Nieuport
100 hp Gnome Rotary engine.
Levasseur (French) Nieuport
100 hp Gnome Rotary engine.
R. Garros (French) Morane Saulnier
80 hp Rhone Rotary engine.
Burri (Switzerland) F. B. A. (fb)
100 hp Gnome Rotary engine.
C. Weymann (USA) Nieuport
100 hp Gnome Rotary engine.
Thaw (USA) Deperdussin
160 hp Gnome Rotary engine.

Stoeffler of Germany had entered an Aviatik but unfortunately crashed before the trials mentioned above. Lord Carbery of England also turned over in rough water with his Morane and so borrowed a Deperdussin for the actual race. Mr. Pixton's machine showed the most promise in the trials, and, while a biplane, demonstrated a surprising speed. Specially modified for the race, this tiny Sopwith had only a span of 25 feet, 6 inches. Lateral control was by wing-warping and it was one of the first single bay biplanes ever built.

On Monday, April 20th at 8:00 a.m. Espanet and Levasseur promptly took off. Pixton and Burri followed and Garros was held in reserve. Lord Carbery then attempted to fly his preliminary lap which, the rules required, involved alighting twice at specified points before taking off to cross the starting line in full flight. His general unfamiliarity with the Deperdussin on these maneuvers caused him to abandon the race. In the meanwhile, Pixton, with amazing regularity, was averaging a speed of 89.4 mph at 150 kilometers. This speed superiority was so obvious

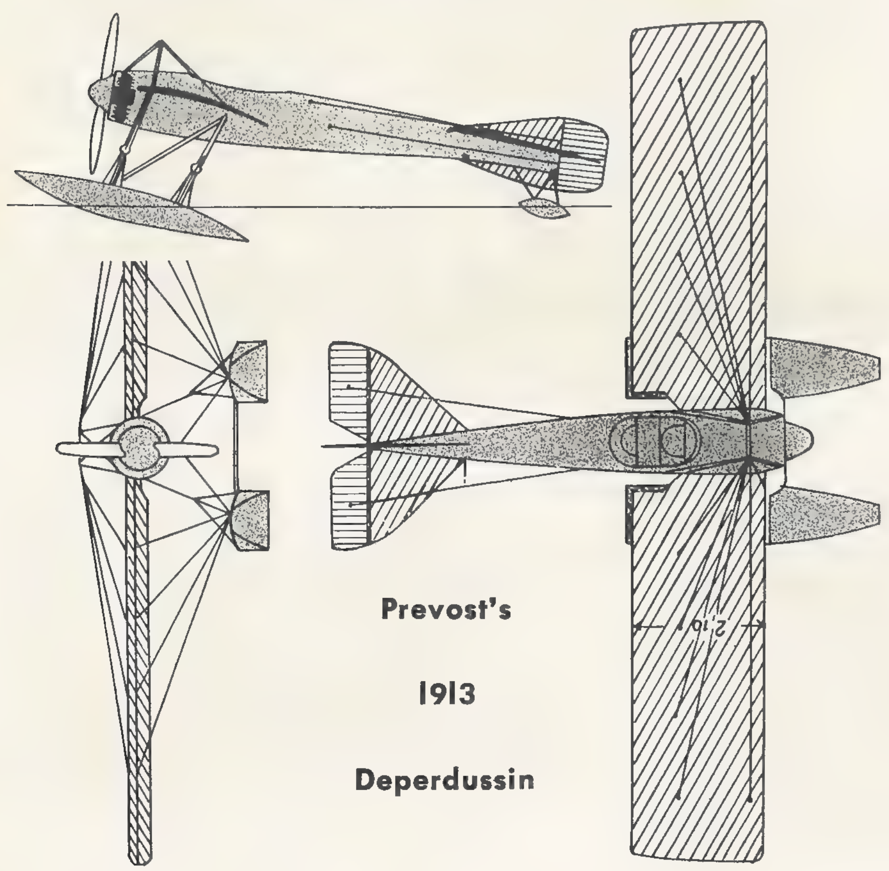
Howard Pixton, winner of the 1914 event, at the conclusion of the Race, and the Sopwith Tabloid Seaplane.

THE BIRTH OF SPEED

that Garros, Weymann and Thaw decided to abandon even an attempt to compete. Espanet was forced down at the 16th lap with engine trouble and on the next round Levasseur also retired with an overheated engine. Burri, the plucky Swiss flyer, maintained a steady 60 mph and at the 23rd lap landed and refueldd. While the F. B. A. Flying Boat was refueling, Pixton crossed the finish line, having flown the full 277.8 kilometers at an average speed of 86.78 mph. Burri took off again after refueling and completed the course at an average speed of 51 mph to place second. It is worth mentioning that the Frenchman, Levasseur, resumed later in the day, with the intention of qualifying for third place, but after completing nine more rounds he too retired.

After finishing the course, Mr. Pixton flew two extra laps at full throttle to record the "Tabloid's" time over a full 300 kilometers. His total time was 2 hours, 9 minutes, 10 seconds, giving an average speed of 92 mph and a new world's record for seaplanes. This victory for England was especially significant as it marked an initial move in international aviation competition for the British aircraft industry. The success of Mr. Pixton was celebrated by an informal luncheon given by the Royal Aero Club on Tuesday, May 12, 1914. During the toasts in honor of Mr. Pixton the Marquess of Tullibardine, Chairman of the Royal Aero Club, stated, "True, in the Sopwith machine the motor was French, but we need not grudge this share of victory to our good friends across the channel, and it is only fair to recollect how much the Gnome motor has assisted all constructors and pilots in advancing the science and practice of aviation for the past four years. We can only hope that the Government Air Engine Competition now in progress may produce one or more British motors the equal, if not superior, of anything designed and manufactured abroad." How prophetic were these words of the Marquess, as future events of the Schneider most certainly disclosed.

THE FIRST SCHNEIDER TROPHY WINNER



Prevost's

1913

Deperdussin

COURTNEY'S CORNER

BY FRANK T. COURTNEY

THE SOPWITH CAMEL

The Sopwith Camel competes with the SE5 and the Spad for the title of most effective fighter plane of World War I. But in general characteristics, the Camel had little resemblance to the others, or to anything else; it was in a class by itself. One of my World War I test jobs was comparing Camels with different engine installations: Clerget, LeRhone, Bentley and the 150 hp Monosoupape Gnome.

Strangely enough, if analyzed point by point on accepted principles of design, the Camel was a pretty bad airplane. I have never found an authentic explanation of why the pilot was put in front of the tank, but the most probable reason was to improve his fighting view downwards-and-forwards with respect to the lower wing. Whatever the reason, the result was a somewhat unstable and tail-heavy aircraft at the start of a flight, which became slightly stable and nose-heavy as fuel was consumed. The lower wing dihedral, with the straight-across upper wing, did its reasonable best to "shut in" the pilot's side ways view. The upper wing was so placed as to provide maximum obstruction to the pilot's upward view, and had to have a hole cut in it to give the pilot a very slight chance to see where he was going on a turn; this hole, incidentally, did a lot of no good to the aircraft's effective aspect ratio. Even its name was all wrong for so nimble a craft; it got the name from the humped fairing around the cockpit. All standard indications are that the Camel would have been a much better aircraft with the pilot and tank locations interchanged, and dihedral on both wings. Somehow, I suspect it wouldn't. Anyway, for such a bad airplane, it was an amazingly good one.

The Camel was probably the most maneuverable airplane ever built, and it achieved that status by unique characteristics. Maneuvering was shared about 50-50 by the airplane and the pilot. The airplane could, and often would, perform praiseworthy stunts on its own. If its efforts were aided and abetted by a pilot who knew what it wanted to do, almost anything could be done with a Camel short of passing through the eye of a needle; whereas, if the pilot applied educated opposition, any maneuver could be arrested instantly and it became a docile and straight-and-level vehicle. For the sheer fun of getting into trouble quickly and out of it just as quickly, the Camel has never been equalled. For dog-fighting, of course, it was superb.

All this came about because, relative to its dimensions and concentrated mass characteristics, its control surfaces were very light and powerful, and the gyroscopic forces from the rotary engine, naturally acting at 90 degrees to the applied control force, were extremely pronounced. Consequently, an educated use of these gyroscopic forces could be employed to reinforce or oppose already powerful control-surface effects in either starting or stopping any antics. The trouble with pilots was getting them educated in sufficient time to the fact that if the pilot didn't use those forces, the Camel used them anyway, and used them fast.

Hence the somewhat grisly record of training fatalities on Camels. Earlier Camel pilots, recognizing that they had a wily beast to handle, studied its tricks at a respectful distance from the ground, and then, finding out what could really be done with it, made a habit if taking horrible liberties a few feet up, recovering without difficulty from apparently impossible attitudes. It all looked very easy, and so it was, if the pilot had learned how much he was doing and how much the Camel was doing. But, in those happy days when enthusiasm was standard equipment and caution considered a waste of time, too many pilots decided that a oouple of solo flights on a Camel entitled them to take the same liberties as the experts did, and mortality was high.

That's why you so frequently hear of a "good Camel pilot;" either a Camel pilot was good or he just wasn't there.

F.T.C.

THE HANRIOT THAT WAS NUNGESSER'S

BY ED MALONEY

Charles Nungesser, called the "Iron Man" of the French Air Service in World War I, was one of the most reckless and courageous of all the flyers who took part in that aerial age, 1914-1918. By all accounts, those who knew him declared him to be a "fine fellow and an excellent pilot." His bravery and skill as a pilot are attested to by his record of 45 enemy aircraft downed in action. That he lost his life in a peacetime attempt to cross the Atlantic by air, but a few days before Lindbergh won the Orteig Prize, was just one more episode in a very daring lifetime, but a great loss to the flying profession.

The airplane which Nungesser brought to this country following the War, for exhibition purposes, is still in existence, having been located, restored, and placed in the Air Museum in Claremont, California, by the author. It is the same plane used by Nungesser in scoring many of his e.a. destroyed, and this type was also used by the Belgians and Italians during the War, and by the United States Navy during and after the War. It is the Hanriot HD-1.

Nungesser came to be known as the "Iron Man" because of the many injuries he sustained in combat and crash landings while in the Air Corps. In all, he was wounded seventeen times, and his airplanes were severely damaged innumerably. He was awarded many decorations and at war's end, was the third ranking French flyer of the War in numbers of the enemy downed.

In 1924, Nungesser and two other French pilots brought the Hanriot of this story, and a Nieuport 18 and a Potez, to the United States to embark on a barnstorming career lasting nearly three years, doing stunting at county fairs, air races, and wherever crowds could be gathered together for charter flights or dollar rides.

In 1925 Nungesser took part in the first aviation motion picture thriller made following the Great War. It was "The Sky Raider," filmed at Roosevelt Field, Long Island, and both the Hanriot and the Nieuport were used. When the picture was completed, Nungesser arranged to travel with it on a nation-wide tour from New York to San Diego, doing stunts every day over the city where the picture was being shown, to attract attention to it.

The tour almost ended at Denver, Colorado, when a weld broke loose at the motor mount and the airplane began to shake violently. Nungesser landed safely but the tour was interrupted and the Hanriot was shipped on to Santa Monica, California. There it was repaired in the shop of A. J. Montee at Clover Field.

After his airplane was repaired, Nungesser continued stunting each day over the Pantages Theatre in Hollywood until the end of the picture's showing. The Hanriot was left in the care of Mr. Montee at Clover Field while Nungesser went off to plan for his trans-Atlantic flight in the spring of 1927 with Major Francis Coli.

For their oceanic attempt, then becoming the goal of many a professional pilot, Nungesser and Coli obtained a Levasseur biplane which they promptly named the "Oiseau Blanc" or "White Bird." It had a 450 hp Lorraine-Dietrich engine and they equipped it with the best instruments and flying gear of that day.

On May 9, 1927, Nungesser and Coli took off from Paris, attempting the East-West crossing of the Atlantic, just twelve days before the Lone Eagle made his successful crossing from West to East. The "White Bird" was last sighted at 11:00 A. M. off the coast of Ireland and the flyers were presumed lost at sea.

Nungesser's Hanriot Scout was auctioned off some time later to pay the storage bill then due, and was bought by Jim Granger, who flew the airplane from time to time in various motion pictures which were then being filmed in Southern California. It was flown in both "Wings" and "Hell's Angels" and at the premiere of the latter picture was placed on display at the front of Grauman's Chinese Theatre in Hollywood. Following this, the airplane was kept in a hangar at Clover Field for several years, where the kids and other curious could walk up to it and speculate on its past history and the unique insignia carried on the side of the fuselage.

This insignia had become Nungesser's during the War when he learned that a reward had been offered for his death or capture by the Germans. It was a sort of reply to this and each of the items had a special significance to Nungesser. On a large black heart there were the familiar skull and bones, and also two burning candles and a coffin. The insignia was painted on all of his latter wartime aircraft, his barnstorming planes after the War, and really came to prominence in the publicity attending his trans-Atlantic attempt.

The Hanriot that was Nungesser's was placed in storage by Mr. Granger in 1933, where it remained until February, 1951, when the author sought it out and purchased it from Mrs. Granger. It has been restored to almost flying condition, and is now in the Air Museum at Claremont, California.

Specifications:

Span,	upper	28'-6 1/2"
	lower	24'-3"
Chord,	upper	4'-1"
	lower	3'-10 1/2"
Length		19'-6"
Height		9'-8"
Engine - 110 HP LeRhone Rotary		
Weight,	empty	1021 lbs.
	gross	1605 lbs.

Service History:

Apparently Nungesser shared the same regard for the Hanriot as other pilots who had actually used this type in wartime service - the regard for a fine horse. Major Willy Coppens described it thusly: "I fell in love with the Hanriot at first sight. It was as light as a feather on the controls and the pilot had a wonderfully clear field of vision. Although my first flight on the machine was made in extremely bad weather, I landed it perfectly, ... and was delighted with it. . . . It was strong in spite of its apparent fragility, and was faster and climbed better than the Nieuport."

The Hanriot HD-1 came into service in mid-1917 with the Belgian Flying Service and the Italian Air Service, and in very limited use with the French, in whose country it was produced. The United States Navy procured from the French a number of Hanriots which were used at Naval Stations on the French coast, and actually constructed ten HD-1's at the Naval Aircraft Factory, Philadelphia, after War's end. The Naval Hanriots were used for pilot training for several years after the War.

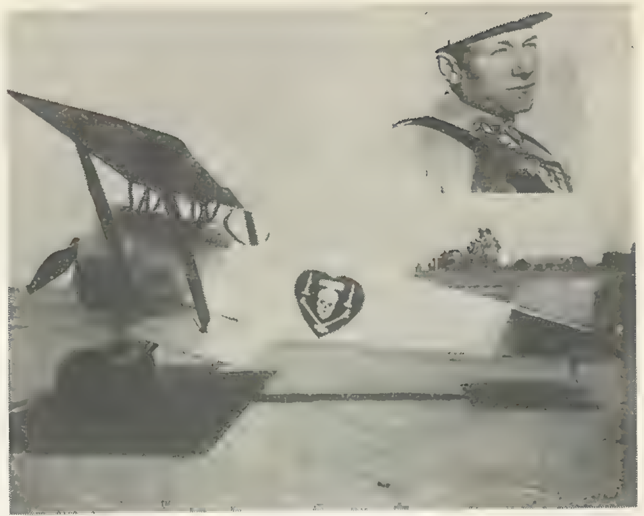
One of ten Hanriot HD-1's built at the Naval Aircraft Factory, Philadelphia.

Hanriot HD-1's, Italian-built, with some special insignia.

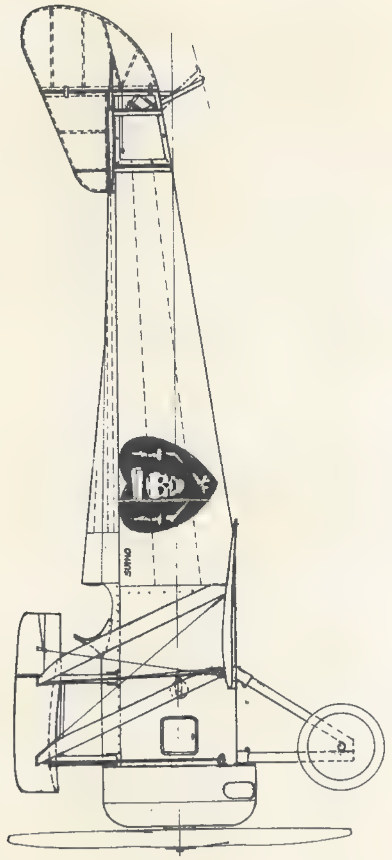
Aeronautica

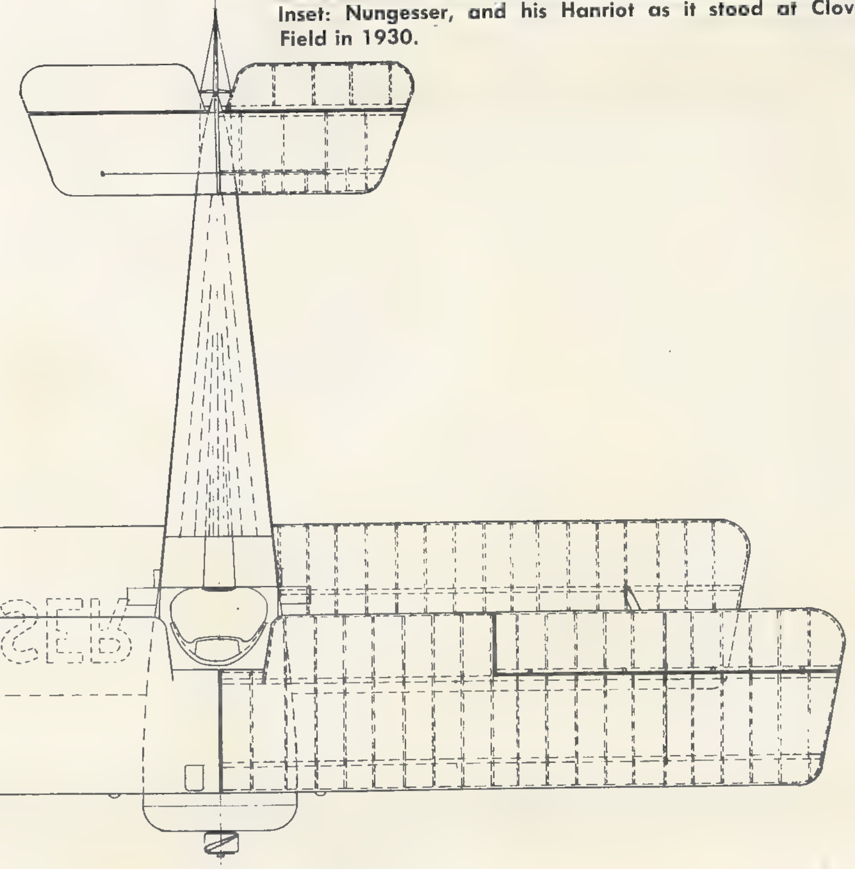
HANRIOT

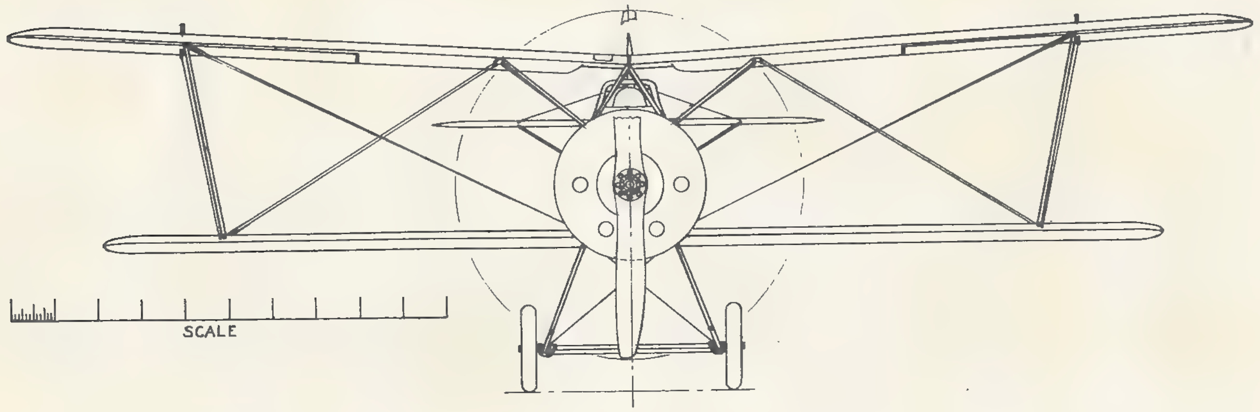
HD-1



Inset: Nungesser, and his Hanriot as it stood at Clover Field in 1930.







JOHN SLOAN

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AERONAUTICA

Thomas P. Faulconer

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INSTITUTE OF THE AERONAUTICAL SCIENCES

Volume 5 **JULY-DEC. 1953** **Numbers 3 & 4**

BASIC MISSION an editorial

A HALF-CENTURY OF POWERED FLIGHT

BY S. PAUL JOHNSTON

During this year of the Fiftieth Anniversary of Powered Flight there has been an unprecedented interest in the history of aeronautics. Aviation writers have left few avenues unexplored. Every possible combination of adjectives has been put together to analyze and explain the success of the Wright Brothers.

The Historical Associates of the Institute of Aeronautical Sciences have marked the occasion well. The construction of the replica of the "Kitty Hawk" in which the Historical Associates participated, was a notable achievement. The discussions at our several meetings with such early pioneers as General Lahm, Grover Loening, Roy Knabenshue and others, have added much to the personal record of the Wrights. Through such meetings we have come to a better understanding of the Brothers from Dayton as individuals.

On the seventeenth of December, 1903, Orville Wright flew for twelve seconds over the sand dunes at Kitty Hawk. Later the same day, his brother, Wilbur, remained in the air for fifty-nine seconds and covered a distance of eight hundred and fifty-two feet. The craft they flew was, in external appearance, little more than a powered version of the biplane kite which they had first flown only three years before; yet it embodied elements of aerodynamics and control which remain unchanged in principle up to the present day.

Havelock Ellis once wrote:

"The world's greatest thinkers have often been amateurs; for high thinking is the outcome of fine and independent living, and for that a professorial chair offers no special opportunities."

The Wright Brothers were amateurs in the finest sense. It is to their insight and high achievement that this issue of "Aeronautica" is dedicated.

One characteristic of the Wrights that has become increasingly clear was their interest in the forward view. They tried to look ahead to evaluate the things that they had made possible. But their view was limited. They did not dare let their imaginations reach even to levels that have long since been accepted as commonplace. No one had yet scaled the heights of the 1950's from which our forward vision seems almost limitless. As late as 1910 it would have been a reckless individual indeed who would speak of speeds of a hundred miles an hour. We can be certain that any possibility of human flight at 1300 miles an hour some 80,000 feet above the surface of the earth would have seemed utterly fantastic to Wilbur Wright; and that one could write editorials such as this one, seated comfortably in a 4-engined all-metal airplane flying over the snow-covered Rockies at nearly 400 miles an hour at 19,000 feet above sea level, would have been beyond his wildest dreaming. They did not have the advantage of the perspective of fifty years of flight experience.

Today we have that advantage, and in that particular, by better understanding of the thinking of the pioneers (in every field of aeronautics), the pattern of the prologue of the future takes shape.

Prime objectives must, of course, be kept in view. The Institute, as an engineering and scientific society, deals in futures. Its membership, to justify its existence, must always be a jump or two ahead of the present. But the Historical Associates of the Institute do perform a great and useful function. By providing the perspective, they can set up the background against which the achievements of the present and the future may be measured. That, it seems to us, is their primary mission.

AERONAUTICA

Official Publication for Historical Associates

CONTENTS

Volume 5 Numbers 3 & 4

FEATURES

A Half-Century of Powered Flight - by S. Paul Johnston 1
The Birth of Speed (Part Two) - by Jack D. Canary 3
The Engineering Development of the Wright Brothers' Airplane - by R. B. Johnston 4
Project Durand - The Wright Replica 6
The Wright Flyer Three - View 8
The Wright Brothers' Experiments in Gliding - by Captain Ralph S. Barnaby 10

DEPARTMENTS

Courtney's Corner 16
Trader's Column 2
Aerial Post 2

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A WHATSIT

The picture below shows a Sherburn Monoplane. According to J. M. Bruce of Birmingham, England, it was designed by a Dutchman named Holle, later responsible for the design of the Alula wing, and the plan-form of this wing is similar to the Alula. The engine is thought to be a Clerget, which would place its age at somewhere in the late 'teens or early twenties. Anyone with further information regarding this airplane is requested to communicate with the editors of "Aeronautica."

Previous issues of "Aeronautica" have shown, in the "Whatsit" column, a Curtiss airplane built to prove certain patent ideas, as outlined in the July 1949 issue of "Aeronautica," and which, incidentally, very few readers identified as "Dalton's Duck," designed by Alexander Goupil. Also, in the July to December, 1952 issue, the Wright model L biplane, designed by Roy Knabenshue, was shown. George Hardie of Milwaukee has written "Aeronautica" about a considerable amount of information available on this airplane. The photograph printed was from Knabenshue's own picture album, and according to him, it was designed as a trainer at a time when the U. S. was trying to catch up with European designs, which had forged ahead under the impetus of World War I.

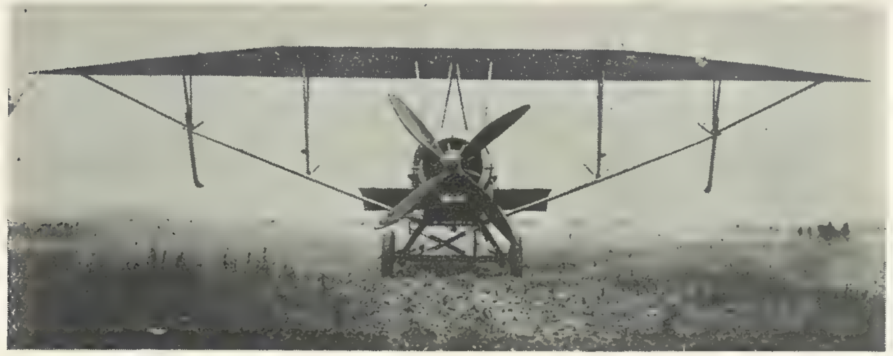


PHOTO CREDITS

Page 2, Jack Bruce. Page 3, Savoia, "Flight Magazine." Page 4, Smithsonian Inst., U. S. A. F. Page 5, Franklin Inst. Page 10, Smithsonian Inst. Page 11, Smithsonian Inst. Page 14, Franklin Inst. Page 15, Savoia, Vickers-Armstrong, Ltd. Page 16, Philip Bjorklund.

H.A.'s MEET IN NEW YORK

On October 27th, at the IAS Building in New York, the Historical Section of the Institute had the privilege of hearing Mr. Grover Loening speak on the Wright Company activities in 1912-1914.

It was during this period that Mr. Loening was so closely associated with the Wright Brothers, and it was in keeping with the Fiftieth Anniversary of Powered Flight that he told the group a little about the personal lives of the two men. Early in Mr. Loening's collaboration with the Wrights came his first experience in flying a Wright plane at the Wright field.

The Wright plant at Dayton was built in 1911. The development of the 6-cylinder engine and the Model E followed shortly thereafter. It was also during these years that Orville Wright won the Collier Trophy "for development and demonstration of his automatic stabilizer." The experimentation, theories, and test leading up to the demonstration flight of the stabilizer were discussed.

Mr. Loening then told the story of the Wright Aeroboat, in whose design and development he played a major role. The use of this machine for exhibition flying and the carrying of passengers was all part of the activity centering at the Dayton factory.

Slides, made from Mr. Loening's own collection of photographs, were shown.

L.A. BRANCH ACTIVITIES

The Los Angeles Historical Branch continued its high level of programs during the Fall. New officers were Jack D. Canary, Chairman; Fred Buehl, Vice-Chairman; Ed Maloney, Secretary, and Karl Bergey, Treasurer. They presented for September the film "Development of the Spitfire," and in October, Walt Disney's "History of Flight." Norman Meadowcroft, a one-time R. N. A. S. officer, described "170 years of lighter-than-air transportation" in November, outlined with slides and movies, and preprinted by a historical brief available at 25¢ from the Los Angeles Branch Treasurer. December 17th honored the Wrights, with the talk given by Robert B. Johnston, at which nearly 500 local HA members and guests were present.

AIR BAGGAGE LABELS

In July, 1953, the Museum of the Institute was fortunate enough to receive a gift of 4,176 Air Baggage Labels from Mr. Herbert A. Schoenfeld, of Tacoma, Washington. Handsomely mounted in seven albums, the collection consists of United States Air Baggage Labels as well as foreign labels. This we believe to be one of the most extensive collections of its kind in the world. Mr. Schoenfeld has exhibited it in this country, London, and elsewhere.

Air Baggage Labels are a means of tracing aviation history, if properly catalogued. They are also useful in showing air routes, and the type of equipment that an airline has used. Since Mr. Schoenfeld's collection is catalogued, it should be of value to those working on aeronautical history. Some of the many countries included in the foreign labels are Persia, New Guinea, India, Bolivia, and Bulgaria. We are grateful to Mr. Schoenfeld for making us the recipient of his collection.

THE BIRTH OF SPEED

Part Two of THE SCHNEIDER TROPHY RACES

BY JACK D. CANARY

THE THIRD SCHNEIDER TROPHY CONTEST was not held until 1919 due to the war and was organized under the auspices of the Royal Aero Club of England. A 20 nautical mile triangular course was set up starting and finishing off Bournemouth Pier. Ten laps of the course were to be flown giving a total distance of 200 nautical miles. On Sept. 10, 1919, the following machines were lined up for the event:

Sq. Comm. Hobbs (GB) Supermarine "Sea Lion"
450 hp Napier "Lion" engine.
Lt. Col. Nicholl (GB) Fairey III
450 hp Napier "Lion" engine.
H. Hawker (GB) Sopwith "Schneider"
450 hp Cosmos "Jupiter."
Casale (French) Nieuport
360 hp Hispano Suiza
Malard (French) Nieuport
360 hp Hispano Suiza
Sadi Lecointe (F) Spad-Herbemont
360 hp Hispano Suiza
Janello (Italy) Savoia S. 13
250 hp Isotta-Fraschini

In the face of rather thick fog over the Swanage Bay area the contest finally started when the Fairey III piloted by Lt. Col. Nicholl was the first one off at 4:50 p. m. Next to become airborne was Sq. Comm. Hobbs in the Supermarine "Sea Lion." Soon these contestants disappeared in the fog while Harry Hawker in his Sopwith jockeyed into position. The starter, in a motor launch, had intended to wave a red flag when each seaplane was to start its takeoff, but the continual postponement of the event throughout the day due to weather had upset the plans to the extent that some confusion existed as to the order of takeoff. Hawker finally took off without the customary lowering of the red flag and was followed shortly afterwards by Janello in the Savoia. None of the French machines were able to start because of floats damaged and leaking, so it remained for the Italian, Janello, to challenge all three British entries.

Shortly a plane was heard overhead, coming from inland, which proved to be the Fairey. Lt. Col. Nicholl, finding the weather too thick, had decided to abandon the race. As he landed near the pier Hawker too appeared and alighted. Both pilots reported extremely poor visibility near the markers indicating the turning points, so had decided against further participation. The Savoia was, however, seen to make a landing near Boscombe Pier, as prescribed for the lap. It got off again and approached Bournemouth Pier, touching the sea again before reaching the pier. Janello had seen the Fairey and Sopwith down and for a moment had thought the race had been called off. One of the contest officials waved the plucky Italian on so he took off again and continued the race. The Supermarine was next seen making its required landing near Boscombe Pier but as its speed dropped off it was seen to pitch up on its nose. Sq. Comm. Hobbs was speedily rescued unhurt and related that he had struck an object when he took off which damaged his hull. Accordingly on landing the rent caused the plane to deaccelerate rapidly enough to capsize. It was an unfortunate occurrence as the Supermarine was felt to have a good chance of winning the event.

Regularly about every ten minutes the Savoia appeared out of the fog, rounded the turn at Bournemouth Pier. and was swallowed again in the mist over Swanage. It became a race against the dark for Janello and finally he completed his tenth lap and landed. Those spectators who had not wearied and headed for home gave the Savoia a roar of approval as it taxied to shore and was surrounded by the Italian delegation. From the Swanage Bay mark boat then came the discouraging news that they had not seen the Savoia on any of its laps. That Janello had been rounding a boat was certain from the regularity with which he passed the pier on each lap. It was indeed an unfortunate mistake for the Italian to make and one easily explained from the poor visibility over the entire course. Several appeals to the Contest Committee of the Royal Aero Club by D. Lorenzo Santoni of the Societa Idrovolanti Alta Italia did not prevent the contest from being declared void, but in token of appreciation of the way Janello had flown his machine under bad weather conditions, it was, however, decided to entrust the organization of the next contest to Italy. This was a sportsmanlike decision on the part of the Royal Aero Club and spoke highly of the regard that all the

(Continued on Page 15)

Savoia S-13, only aircraft to complete ten laps at Cowes, 1919, Janello up.

R. Conflenti, designer, L. Santoni, builder, and Janello, pilot of the 1919 Savoia S-13.

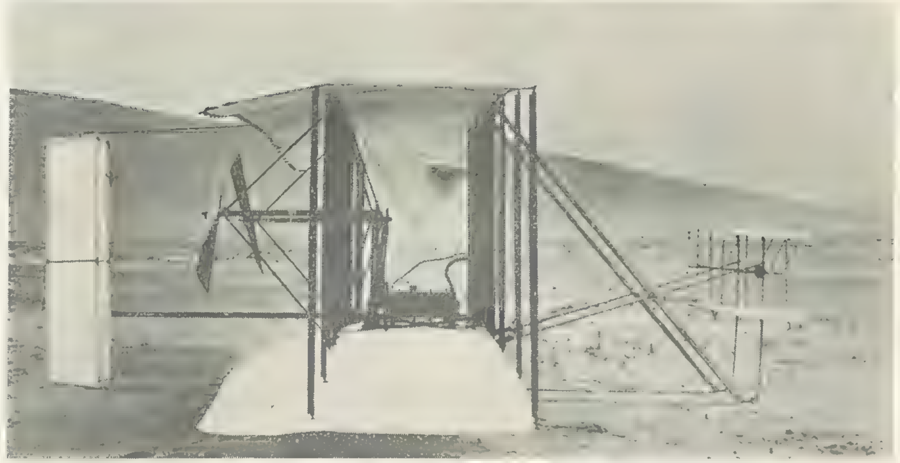
ENGINEERING DEVELOPMENT OF THE WRIGHT AIRPLANE

BY ROBERT B. JOHNSTON

The Wright brothers were much like the designers of today's airplanes in that they borrowed the best points of previous designers' efforts. As today no airplane is entirely new, so the Wrights did not invent all of the airplane themselves.

Experimenters prior to the Wrights may be divided roughly into two schools of thought. One school believed that power was the prime necessity for flight and that a machine should be gotten into the air first and that methods of controlling it could be worked out later. Sir Hiram Maxim and the French experimenter Ader were of this school. The second school was of the opinion that stability and control were of prime importance and that it would be an easy step from successful gliding flight to powered flight. Lilienthal and Octave Chanute were of this school. The Wrights, possibly through association with Mr. Chanute, became advocates of the latter group.

The experiments of Lilienthal and Chanute were made in hang gliders in which control was achieved by shifting the pilot's weight fore and aft and from side to side. It was obvious to the Wrights, especially in view of several fatal accidents that had occurred in this type of glider, that the method of control was inadequate and that very definite size and flight duration limits were imposed by this crude control system. A practical flying machine could not use such methods.



Side view of the original Wright aeroplane near Kitty Hawk, N.C. 1903.

The Wrights therefore selected the "horizontal rudder," or as it is now called the elevator, as their means of longitudinal control. This was no innovation. It had been used by several other investigators.

The matter of lateral control was a much greater problem. The available literature on bird flight was of the opinion that birds maintained their lateral balance by partially retracting one wing or the other as required. This was essentially used in the hang gliders when the C. G. was shifted.

After some observation of the flight of the local pigeons and noting the rapidity of their lateral response, the Wrights concluded that lateral motion was achieved by the air force on twisted wings. It was this warping of the wings and the subsequent combination of their motion with that of the rudder that formed the basis of the unbreakable Wright patents.

Plans were laid for a biplane glider with warping wings and a movable horizontal tail. The selection of a biplane type of glider was undoubtedly due to the influence of Octave Chanute. The logical trussing arrangements and ideal structure appealed to Mr. Chanute, a pioneer builder of large railroad bridges.

Kitty Hawk, North Carolina, was selected as the scene of the gliding experiments, upon the U. S. Weather Bureau's report of consistent winds in that location. The Wrights knew that Lilienthal had flown less than five hours in his five years of gliding. This was hardly sufficient practice to qualify one as a bicycle rider and bicycle riding was undoubtedly much simpler than flying. They felt that this rate of gathering flying experience could be improved, and thus planned to fly their glider as a kite in strong winds and to do their gliding in light winds.

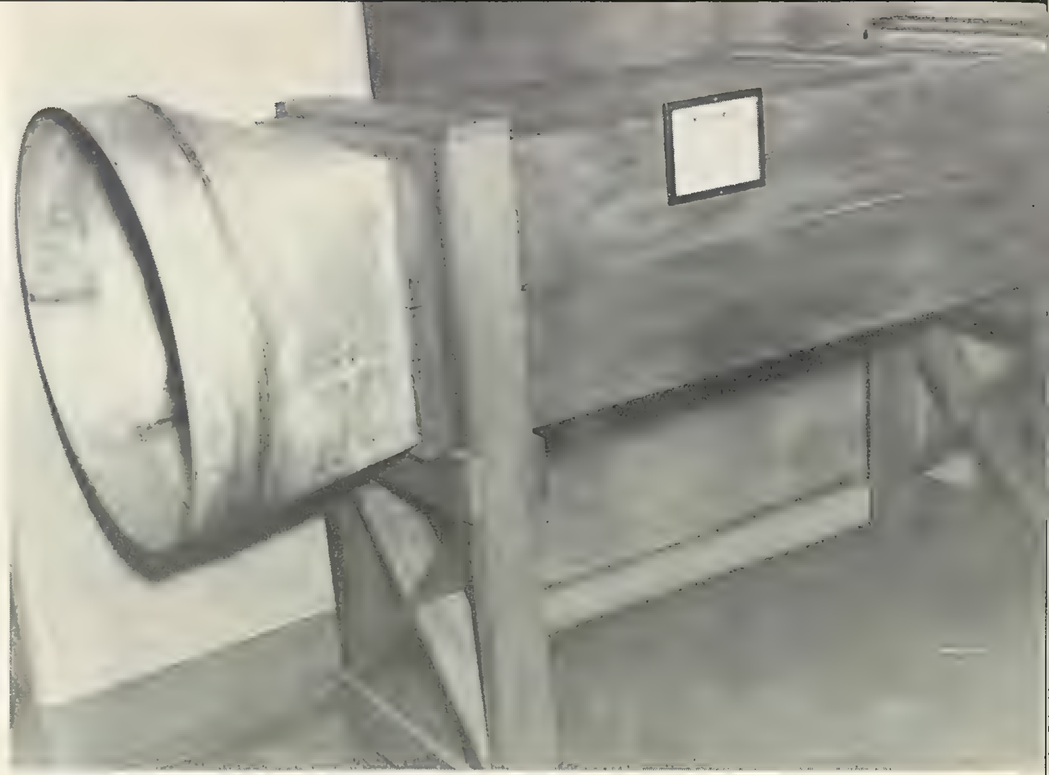
The first glider was built in the summer of 1900. It had a span of 16 1/2 feet and each wing had a chord of 5 feet. It weighed 52 pounds. The wings had a camber ratio of about 1/22. It was intended to fly the machine as a manned kite in winds above 25 MPH and as an unmanned kite or as a glider in lighter winds. Actual gliding was limited to twelve flights. As a result of their summer's experiments the Wrights reached three conclusions:

(1) The horizontal rudder provided ample pitch control.

(2) Satisfactory lateral control could be obtained by warping the wings.

(3) Lift and especially drag were less than would be anticipated from Lilienthal's tables. Lilienthal made many tests of wings in model gliders and free air measurements. These were published in 1889.

The Wrights were encouraged by the results of their experiments and immediately began to lay plans for a new glider. The 1901 glider was again to be used as a man-carrying kite; it had a span of 22 feet with a total area of 290 square feet. The horizontal tail area was increased in proportion. The camber was increased to 1/12, as this appeared to be more desirable from Lilienthal's tables. The glider weighed 108 pounds. The control system was the same as that of the 1900 glider. The first flights revealed a longitudinal instability which had not existed on the previous machine. After some consideration this was ascribed to the increased camber being used and it was reduced to 1/22 as in the 1900 glider. This accomplished the desired results.



The Wright Brothers' 1901 Wind Tunnel. The circular section at the left acted as a shroud for the fan which drew air from right to left through the test section.

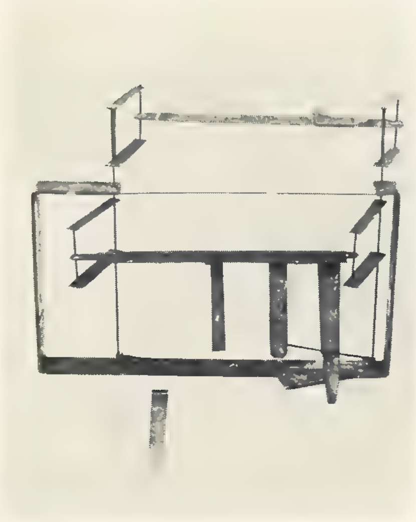
Lilienthal had pointed out the unstable center of pressure movement that is experienced with highly cambered wings but had apparently never experienced this effect at the camber values the Wrights were using. The center of pressure of a cambered wing at zero lift is at minus infinity. As the angle of attack is increased the center of pressure rapidly moves forward to about 25 to 30% of the chord. With the angle of attack increased beyond the stall angle, the center of pressure moves to the rear, reaching the 50% chord point at an angle of attack of 90 degrees. This is contrary to the center of pressure movement of a flat plate. On a flat plate the center of pressure is at the leading edge at zero lift and moves gradually rearward to the 50% chord point at an angle of attack of 90 degrees.

Several hundred successful flights were made, but the altered machine lacked sufficient lifting power to be flown as a man-carrying kite. The lift was about 1/3 of that predicted by the available data.

It was in these flights that the Wrights experienced a type of lateral rocking that might be described as Dutch Roll. Dutch Roll is an unstable motion best described as the rear view of a fat man skating down the ice. The cure that was used is still in use today. They reduced the dihedral. The final configuration had a considerable amount of negative dihedral.

In the fall of 1901 Octave Chanute, who had seen some of the 1901 glider flights, asked Wilbur Wright to speak at a meeting of the Western Society of Engineers on the results of their gliding experiments. In the course of preparing this paper the brothers began to feel that they needed to further substantiate their claims that Lilienthal's tables were in error before they appeared before such a learned group. They therefore constructed a wind tunnel from some old wooden boxes and quickly satisfied themselves that Lilienthal was in error.

After Wilbur's lecture a second and much improved wind tunnel was constructed. The ingenuity used in this tunnel and its associated measuring apparatus was remarkable. Many of today's small wind tunnels could use the balance system to their advantage.



Balance Mechanism of the Wright Brothers' second Wind Tunnel.

The wind tunnel was of the closed throat non-return type with a rectangular cross section. A wind velocity of about 27 MPH was reached by driving the 24 inch diameter 2-bladed fan at about 3000 RPM. The fan was connected to a grinding wheel head which was driven by a belt from their shop line shaft. Power to drive the line shaft was supplied by a 2-hp gasoline engine of their own design.

It must be realized that the whole principle of relative motion upon which wind tunnel testing was based was not thoroughly understood. The Wrights were often forced to defend the principle that moving the air past a body and measuring the results yields the same information as testing a body moving through the air. Also, there was no known method of accurately measuring the air speed or the dynamic pressure. In order to obtain a consistent pattern of test results it was necessary to use a comparison method.

The Wrights solved the problem by balancing the lift of a model wing against the drag of a flat plate normal to the wind. The wing model and the flat plate were mounted on separate horizontal cross stream bars, so linked together that the lift on the wing tended to move it across the stream. The drag on the flat plate would tend to resist this movement. When the two were in balance the ratio of wing lift to the drag of the flat plates was indicated by a pointer. The Wrights later developed a similar system that balanced the wing lift against its drag, resulting in a direct measurement of L/D.

Long before these tests were completed, they had more reliable information at their disposal than any previous experimenters. In later years Orville Wright said that the development of this data, which they felt was comprehensive enough so that anyone using it could have developed a successful airplane, was the achievement that pleased them the most.

In late August 1902 the Wrights returned to Kitty Hawk with a third glider. This machine incorporated the lessons that had been learned from the previous year's experiments and the wind tunnel tests. It had a wing area of 305 square feet and a span of 32 feet, 1 inch. The wing camber ratio was 1/25 with the point of maximum camber well forward. The forward elevator had an area of 15 square feet. The weight without pilot was 116.5 pounds. It was fitted with a pair of fixed vertical fins of 11 2/3 square feet.

The previous glider would sometimes have what is now called adverse yaw when an attempt was made to lift a wing with the lateral control. The fixed vertical tail was an attempt to overcome this problem. It was intended to assist the glider in flying straight ahead.

First flights showed major improvement over the efforts of the previous year. The elevator control was most satisfactory. On some of the flights a new problem arose. The Wrights called the maneuver "well digging" but we now call it spinning. Essentially this is what occurred: one of the wings would drop and the lateral control would be operated to lift that wing. The warping of the wing would increase the angle of attack and therefore the drag on the low wing. If sideslipping had already started, the fixed vertical tail would cause the glider to turn in the direction of the low wing; finally the inside wing would stall, causing a spin to develop. As this only happened about once in fifty

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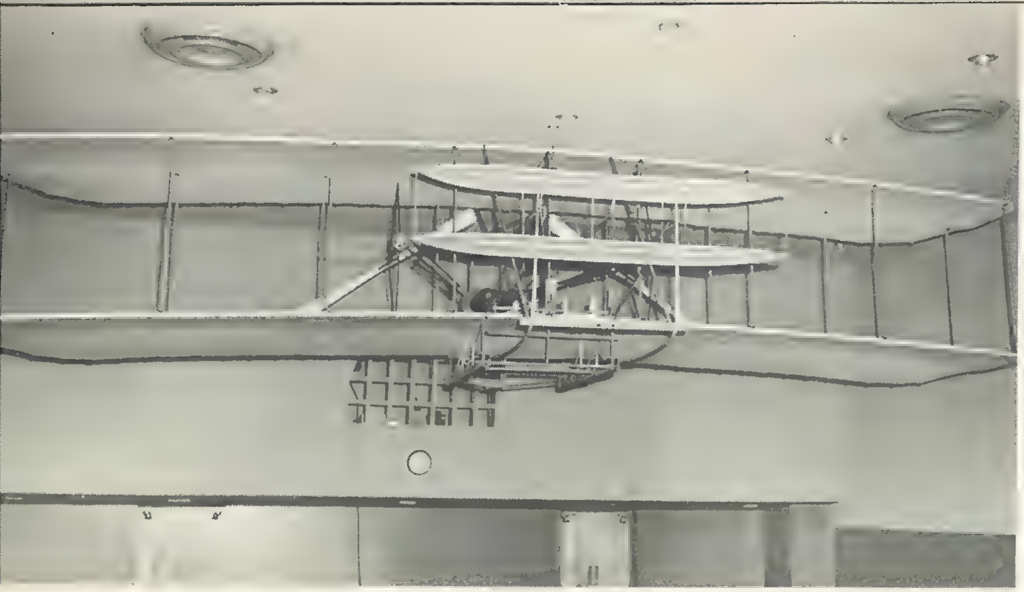


PROJECT DURAND

THE SECOND REPLICA OF THE WRIGHT FLYER

If we were to examine a hypothetical flight log of the original Wright Flyer as it now rests in the Smithsonian, it would read something like this:

DATE	PILOT	FLIGHT DURATION	DIST.
12-17-1903	O. Wright	12 sec.	120 feet
12-17-1903	W. Wright	13 sec.	200 feet
12-17-1903	O. Wright	15 sec.	200 feet
12-17-1903	W. Wright	59 sec.	852 feet

After completing the fourth flight, the front rudder (elevator) was damaged on landing and subsequent winds overturned the machine, damaging the wing structure and propeller chain guides. The airplane was crated up and shipped back to Dayton and never flown again. Paradoxically enough, the Wright biplane, which, along with its creators, is receiving this year's international accolade, had a total flight record of less than two minutes!

The Flyer remained in storage in Dayton untouched until sometime prior to 1917 when Orville Wright decided to rebuild it. Long hours were spent in the re-construction following the original drawings and descriptions still in the Wrights' files.

The original Kitty Hawk airplane was then exhibited only twice in the United States before its shipment to England in 1928 - once at MIT in Boston and once at a New York aeronautics exhibit.

The first replica project was started in England in 1947 prior to the return of the airplane to the United States. It was built as a replacement for the original to be placed in the South Kensington Museum of Science in London. The project was carried out by students of the De Haviland Technical School. In 1948 the project was completed and dedicated.

Project Durand, or the construction of the second Kitty Hawk replica, like Topsy, "just grew." It grew from a long-cherished idea of E. W. Robischon, Western Regional Manager of the IAS, to bring to the West Coast a full-scale replica of the original Kitty Hawk airplane. It grew from the enthusiastic and vigorous support given the project by more than twenty organizations. In the Fall of 1952, Robischon, as Director of the W. F. Durand Museum of the IAS, conceived of the construction of the full-scale replica as a tribute to the 50th Anniversary of Powered Flight. Interest in the project was immediate and with a commitment from several companies to supply components, Robischon contacted John K. Northrop and James L. McKinley of the Northrop Aeronautical Institute. It was agreed that if the Northrop Institute could build the wing cellules and handle the assembly of the finished airplane, the project could proceed.

Actual construction of the replica was begun in November 1952 with British drawings from which the famous "Kensington" model was built. These drawings were later supplemented by data from the National Air Museum. Coordination of the project was under the direction of F. A. Cleveland of the Lockheed Aircraft Corporation.

Enthusiasm ran high among the organizations supplying the component parts. At Marquardt Aircraft a mockup of the original 12 hp engine was built by a volunteer group who contributed their own time to the project. Charles Taylor, the Wrights' bicycle shop foreman, who in 1902 worked on the original engine, contributed valuable technical assistance. The Diamond Chain Company dug out some of its dies to provide the type of chains used on the original. The Longines - Wittnauer Watch Company obtained a French copy of the original Wright anemometer, which was also of French manufacture. The Schrillo Aero Tool Engineering Company reproduced in complete external detail, along with other components, the motorcycle hub used by the Wrights as a trolley roller for the launching gear.

The project was not without its humorous aspects. In the fabrication of the radiator feeder tank assembly, the Young Radiator Company production people were confused by the hidden construction lines shown on the drawings. The Wrights, practical scientists that they were, had used a large paint can or equivalent on the original machine.

Meanwhile, at Pacific Airmotive Corporation, Los Angeles Trade-Technical Junior College, and the Northrop Institute, the horizontal and vertical surfaces and the wing panels began to take shape. At the Northrop Institute and the Los Angeles Trade-Technical Junior College, the bulk of the assembly work was carried on by students. With the completion of the framework, yards of special cotton fabric supplied by Flightex were stretched to the skeleton frame.

As the wing cellules and control surfaces were completed, the finished components -- control pulleys, brackets, cables, drives, and mockup engine -- began to flow into the Northrop Institute. At Northrop, students under the able direction of Ralph Bent began the tedious job of rigging and assembly. The engine was installed, the outriggers and control surfaces were placed in position, and the miles of wire bracing -- all hand-fitted -- were set in place.

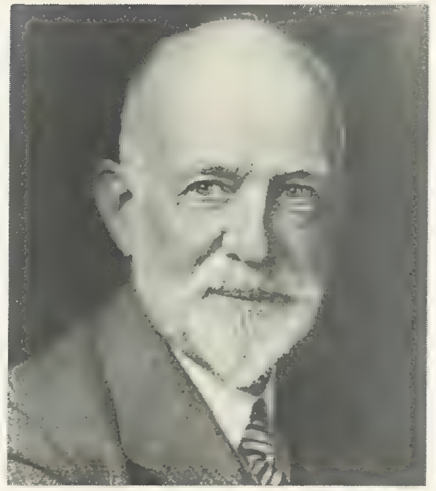
After the assembly was completed, the airplane was readied for the dedication ceremony at the IAS Summer Meeting banquet. The tear-down and re-assembly of the airplane in the Los Angeles Statler Hotel ballroom was a major effort that entailed several of the Historical Associates as well as other Section members. In order to expedite the re-assembly it was decided to move the wing cellules completely rigged. Again the amazing foresight of the Wrights became apparent when it was discovered that the wing cellules cleared the main salon doors of the Statler Hotel by less than 1/4 of an inch!

The Los Angeles Section Historical Associates' contribution to Project Durand was the production of a sixteen page descriptive brochure which was distributed at the Summer Meeting banquet.

The completion of the replica, the only one of its kind in the Western Hemisphere, stands as a tribute to the work begun half a century ago and as a challenge to the future.

E. W. Robischon.

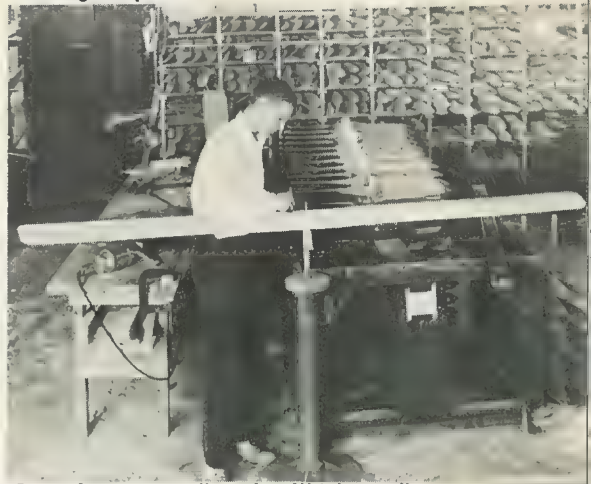
Professor W. F. Durand



CONTRIBUTING ORGANIZATIONS

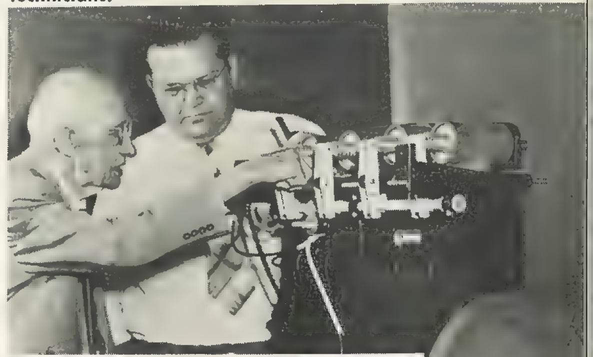
American Helicopter Co. Inc.	Propeller support structure; propeller chain casings and supports.
Apex Wire and Alloys Corp.	All brace wires.
Cal-Aero Tech. Institute	Wing struts, skid framing, stays.
Diamond Chain Co. Inc.	Propeller chains, control system chains, engine chains.
Flightex Fabrics, Inc.	All fabric.
The B. F. Goodrich Co.	All rubber hose and tube.
Lockheed Aircraft Corp.	Project coordination; support and hoist system for IAS building.
Longines-Wittnauer Watch Co. Inc.	Anemometer, stop watch.
Manco Plating Co.	All metal plating.
Marquardt Aircraft Co.	Complete engine.
Meletron Corporation	Flight instrument assembly.
Northrop Aero. Institute	Complete wing panels, all assembly and rigging work.
Pacific Airmotive Corp.	Complete rudder assembly and support structure.
Schrillo Aeronautical Tool Engineering Co.	Strut clips, propeller shafts, chain adjusters, elevator roller.
F. Somers Peterson Co.	Engine revolution counter.
Southern Counties Gas Co. of Calif.	Fuel system cocks.
E. J. Stanton and Son, Inc.	All hard woods.
Stolper Steel Products Corp.	Fuel tank and brackets.
Timm Industries, Inc.	Control levers, pulleys, clips, supports.
U. S. Propellers, Inc.	Two propellers.
Western Gear Works	All engine and propeller gears.
Los Angeles Trade-Technical Junior College	Complete elevator assembly and support structure.
Young Radiator Co.	Engine radiator and clips.

Students of the Northrop Aeronautical Institute assemble structure for wing cellules of Wright replica.



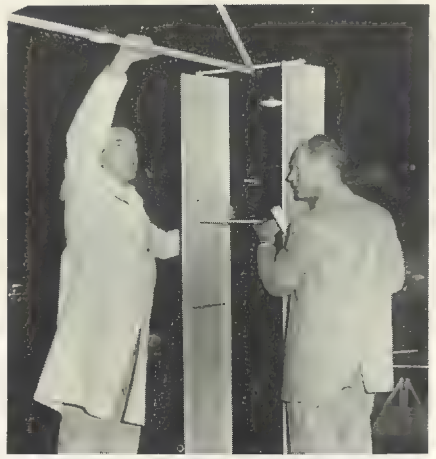
One of two propellers for Wright replica being finished in shops of U.S. Propellers, Inc.

Propeller chain casing supports being assembled by American Helicopter Company technicians.



Charles Taylor, Dayton Mechanic, who built engine for original Wright airplane, points out ignition camshaft of replica engine to Roy Marquardt of Marquardt Aircraft Co.

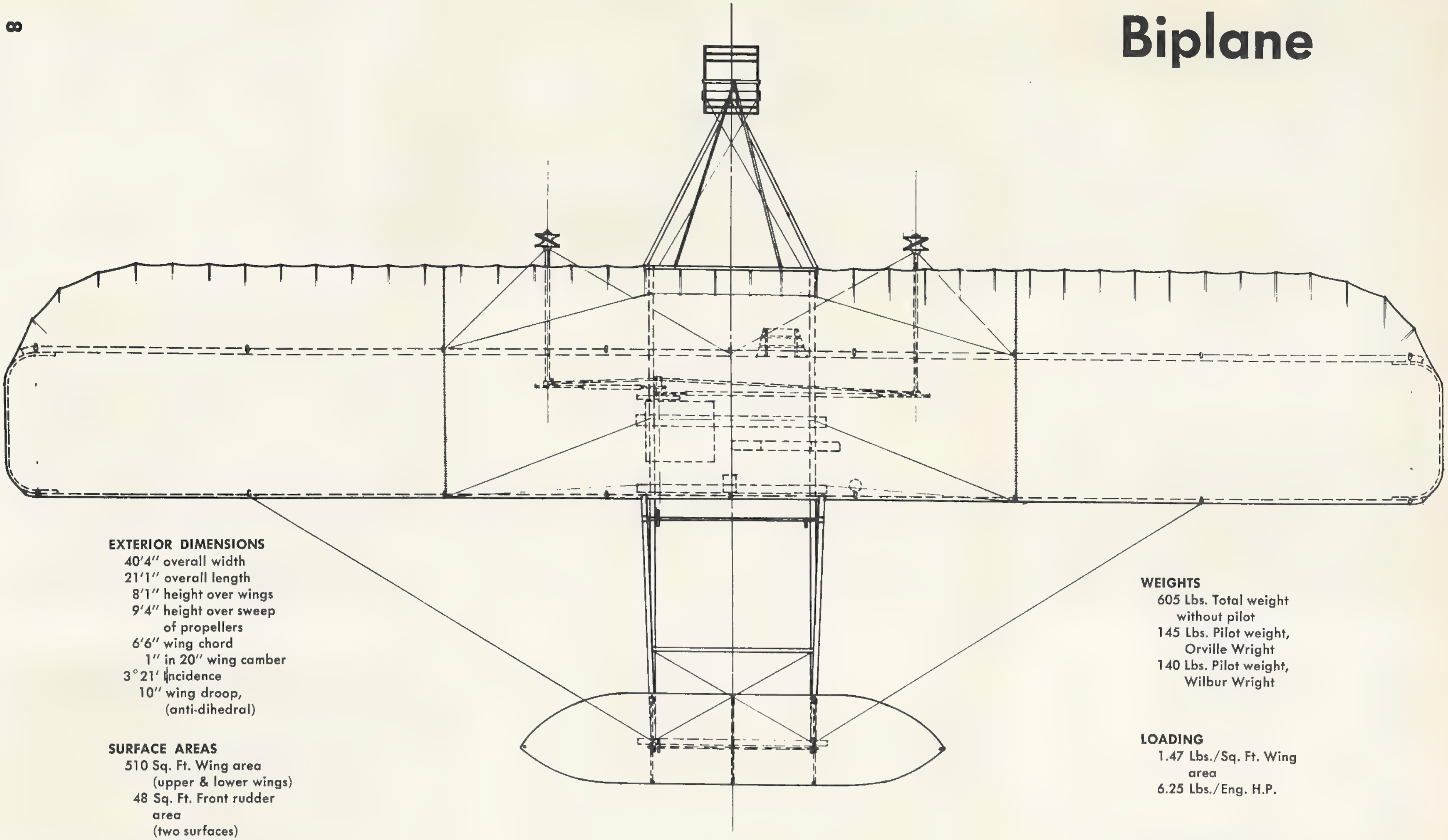
Southern Counties Gas Company machinist threads gasoline line cock for Wright replica.



Rudder for the replica of the Wright Brothers' plane built by Pacific Airmotive Corporation.

3-VIEW

1903 Wright Biplane



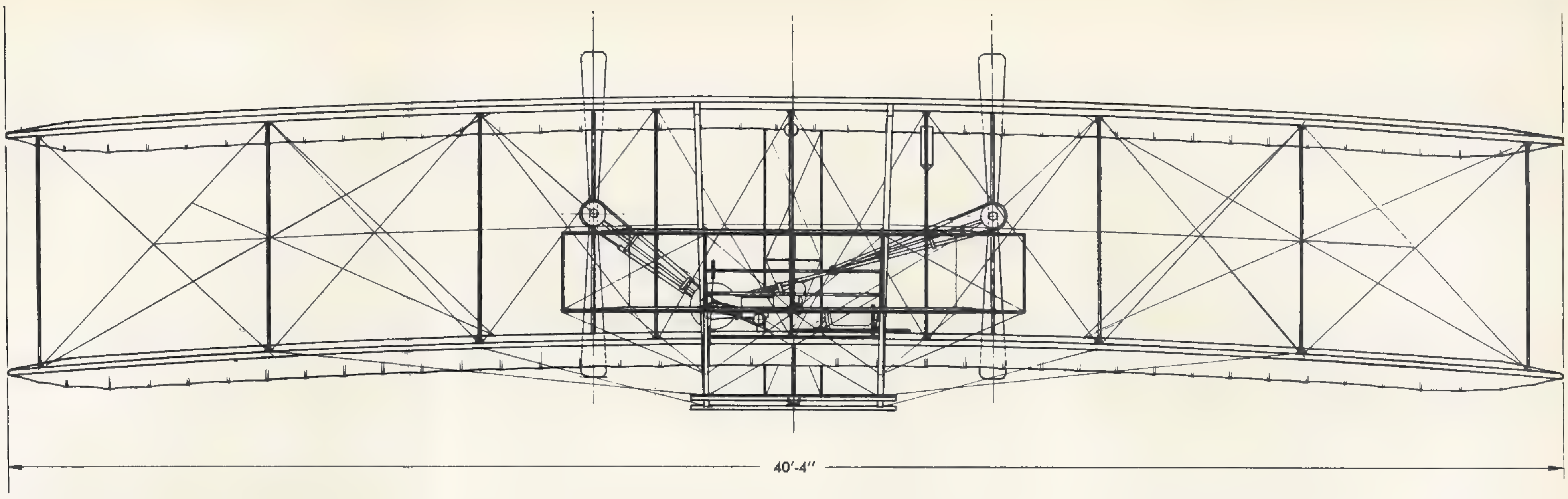
EXTERIOR DIMENSIONS
40'4" overall width
21'1" overall length
8'1" height over wings
9'4" height over sweep of propellers
6'6" wing chord
1" in 20" wing camber
3°21' incidence
10" wing droop, (anti-dihedral)

SURFACE AREAS
510 Sq. Ft. Wing area (upper & lower wings)
48 Sq. Ft. Front rudder area (two surfaces)
20 Sq. Ft. Rear rudder area (two surfaces)

WEIGHTS
605 Lbs. Total weight without pilot
145 Lbs. Pilot weight, Orville Wright
140 Lbs. Pilot weight, Wilbur Wright

LOADING
1.47 Lbs./Sq. Ft. Wing area
6.25 Lbs./Eng. H.P.

ENG. COOLING
Thermo syphon water circulation thru radiator



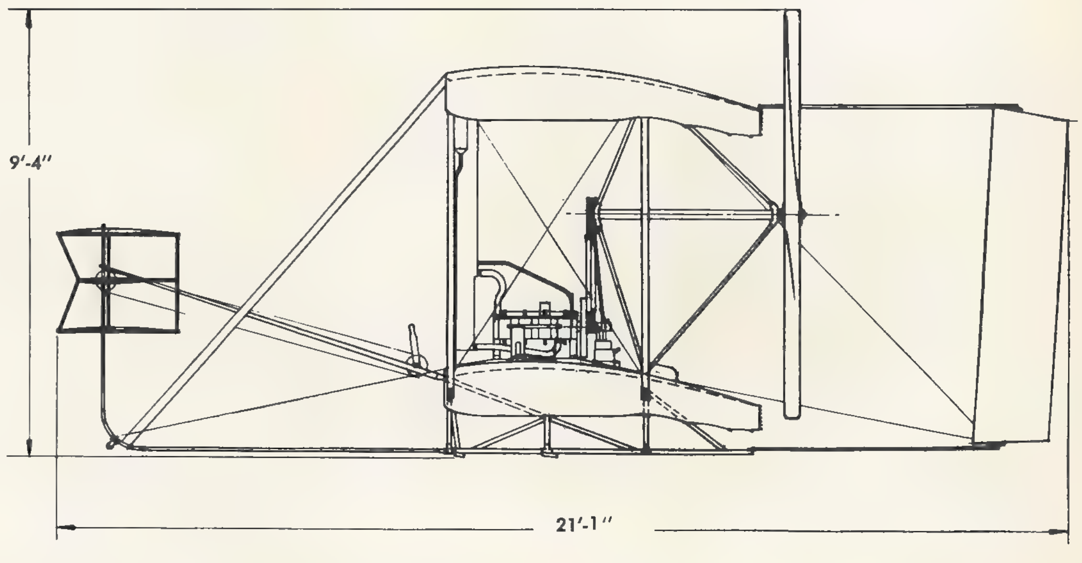
PROPELLERS
Twin props, pusher drive installation, chain driven, rotating in opposite directions.
Roller chains 1" pitch 9/16" dia. X 3/8" width rollers

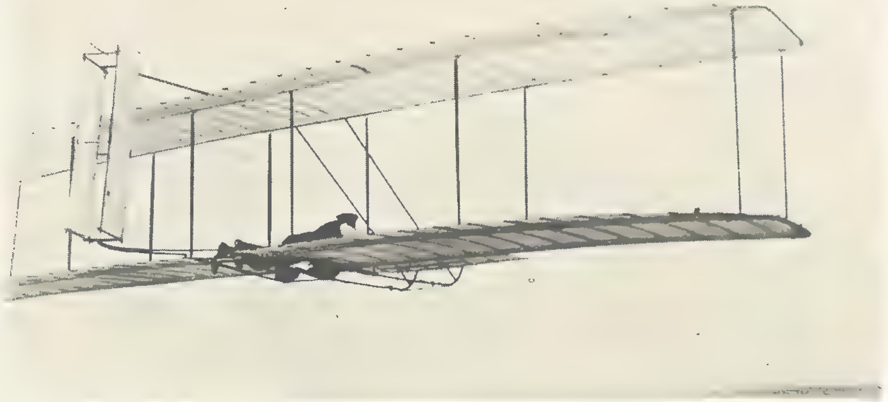
FUEL SYSTEM
Gravity feed thru rubber tubing from 0.4 Gal. capacity tank mounted on upper end of wing Fr. strut.

ENGINE
4 Cylinder, 4 cycle, horizontal gasoline type
4" Bore X 4" Stroke
12 H.P. @ 1020 RPM
152 Lbs. Weight of bare engine
170 Lbs. Complete with Mag. & Accessories

ENGINE IGNITION
Low tension mag., make & break spark
Eng. started with dry batt's., then switched to mag.

ENG. LUBRICATION
Internal splash, actuated by the crankshaft





The 1902 Glider in flight from Kill Devil Hill, October 21, 1903.

PRELUDE TO POWER

BY CAPT. RALPH S. BARNABY, U.S.N. Ret.

In September 1901 and June 1903 Wilbur Wright presented papers to the Western Society of Engineers in Chicago. Appearing before one of the leading engineering societies of the country was a momentous occasion for the Wrights, as they aspired at the time to become known as men of science. But neither the Wright Brothers nor their audience realized the magnitude of the results of the studies they had made with the use of gliders - that through gliding and soaring they had discovered controlled flight by man - which would in the future so ably serve all mankind as well as deliver weapons to destroy.

On the first occasion Mr. Wright was introduced by Dr. Octave Chanute, at that time President of the Society, and under the title of "Some Aeronautical Experiments" gave a detailed account of the gliding experiments conducted by Orville and himself during the fall of 1900 and the summer of 1901.

He told how the glider flights of Liliethal had stimulated their interest in the problem of heavier-than-air flight and how it was their feeling that Lilienthal's approach erred in two important respects. They felt that the attempt to maintain control by moving the center of gravity of the aircraft to coincide with the perambulations of the center of pressure was the wrong approach and that sound structural design was equally important with control. This last point was driven home to them by the fatal accidents to Lilienthal and his disciple, Pilcher, both accidents being the result of structural failure.

The Wrights were quick to recognize and adopt the structural advantages of the Warren-truss type biplane construction of the Chanute glider and to give Chanute credit for "the first in which the principles of the modern truss bridges were fully applied to flying machine construction."

It was the solution of the control problem which they felt was the key to successful flight and which prompted the Wrights to build and fly their first gliders.

To quote from Wilbur Wright's 1901 paper, "As long ago as 1893 a machine weighing 8000 pounds demonstrated its power to both lift itself and maintain a speed of from thirty to forty miles per hour; but it came to grief in an accidental free flight, owing to the inability of the operators to balance and steer it properly. This inability to balance and steer still confronts students of the flying problem, although nearly ten years have passed. When this one feature has been worked out the age of flying machines will have arrived, for all other difficulties are of minor importance."

It had come as rather a shock to Wilbur and Orville to discover that with all his efforts, Otto Lilienthal had accumulated in his five years of experimentation a total of only about five hours in the air. They figured that if a man was going to learn to fly in his normal lifetime his rate of learning would have to increase. They reasoned that if a place could be found where strong winds prevailed it might be possible to fly like a kite, on the end of a rope, and in this way accumulate time by the hour instead of by the second.

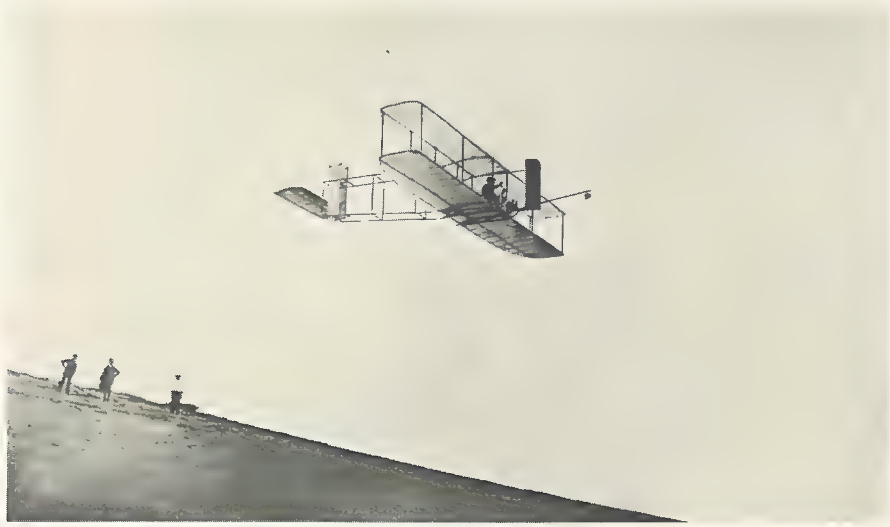
Early in 1900 Wilbur wrote Chanute asking his suggestions as to a site with suitable winds. Among the several places recommended by Chanute, the sand dunes of the Carolina coast seemed the most practical, and so, after some confirmatory data from the Weather Bureau, early in September of that year Wilbur set out for Kitty Hawk, with the "makin's" of the first glider, buying some of the necessary lumber along the way. Orville followed about two weeks later.

While it was originally planned that this first glider would have a wing area of about 200 square feet, lack of suitable spar material necessitated settling for 165 square feet. It had no vertical surfaces. The horizontal rudder, or elevator as we now call it, was in front and was carried at a lesser angle of attack than the wings in order to counterbalance the center of pressure travel of the wings.

Following their original plans, the glider was first flown "captive" with pilot aboard when the winds were strong enough, or empty with cords operating the controls from the ground in lighter winds. The results were encouraging and discouraging. The lift expected, based on the Lilienthal tables, was not realized. What they had expected to obtain at 3 degrees required nearly 20! On the other hand, their system of twisting the surfaces for lateral balance was found very effective, and while the lift was low, drag was only about half that estimated by Chanute for his glider. The low lift was suspected to be one of three things: insufficient camber, porous wing covering, or errors in Lilienthal's figures.

Having done about all they could with captive flight because of the disappointingly low lift, they moved the glider about four miles south to Kill Devil Hill, which was about 100 feet high and had a slope of about 10 degrees, to try piloted free glides.

They planned to launch the glider as a "hang glider," as Lilienthal and Chanute had done; when airborne the pilot would assume prone position for low drag. However, with the strong winds available, it proved much easier to launch with two men holding the wing tips and running into the wind, with the pilot already prone. I have found no record of the duration and length of the glides made that season from Kill Devil Hill. It is recorded, however, that glide paths of a little better than 6:1 were achieved.



1911 Glider at Kitty Hawk, Orville Wright at controls.

The first of these were made with the wings rigid, no lateral control, but later Wilbur activated the warping mechanism and was agreeably surprised by the positiveness of action. These tests brought the first year's flight tests to a close, and by the end of October they returned to Dayton.

Definite ideas for a new glider and plans for the next Kitty Hawk expedition began to crystallize immediately. The new glider would have increased wing camber. Its wing area would be of the order of 300 square feet instead of 165. This would make it by far the largest man-carrying glider yet constructed since Lilienthal's had been 151, Pilcher's 165, and Chanute's 134. However, with a movable front surface and wing warping, instead of dependence on body-shift for control, it was felt that the new machine would be controllable, notwithstanding its great size. By the middle of July, 1901, they were back at Kitty Hawk again, and tests on the new machine were under way by the end of the month.

The first flights were disappointing. Calculations using the Lilienthal tables had indicated that at 17 miles per hour the machine would sustain 240 pounds, the weight of the glider and operator, at an angle of 3 degrees. Actually under these conditions it would scarcely support its own weight. Its lift seemed only about a third of what was expected. Sample test panels eliminated porous fabric as the cause.

Thus the Wrights' idea of captive flying in winds of 18 to 20 miles an hour had to be abandoned in favor of free glides. However, even these gliding flights were not as good as those of the smaller 1900 machine. The 1 to 6 glide path could not be maintained. Longitudinal control was erratic and though glides of over 300 feet were made it was evident that something was wrong. Full elevator control was often needed to prevent the glider from diving into the ground or climbing to a stall.

Deciding that the difficulty stemmed from adverse center of pressure travel due to the deep camber, the ribs were trussed down to reduce the camber from 1 in 12 to 1 in 18. This resulted in considerable improvement both in glide angle and longitudinal control, and glides of 350 feet were made in winds of 10 to 27 miles per hour. Now, however, in free flight, they found that in warping the wings, the additional drag of the side with the increased incidence caused that wing to slow down so that the net effect was less lift than before and instead of rising, that wing would drop.

Wilbur Wright summarized their findings in two years of experimentation, in his 1901 paper as:

1. The lifting power of a large flying machine, held stationary at a small distance from the earth, is much less than the Lilienthal tables and our own laboratory experiments would lead us to expect. When the machine is moved through the air, the difference seems much less marked.
2. That the ratio of drag to lift in well shaped surfaces is less at angles of incidence of 5 degrees to 12 degrees than at an angle of 3 degrees.
3. That in arched surfaces (highly cambered) the center of pressure is near the center of the surface, but moves slowly forward as the angle becomes less, till a critical angle varying with the shape and depth of the curve is reached, after which it moves rapidly toward the rear till the angle of no lift is found.
4. That with similar conditions, large surfaces may be controlled with not much greater difficulty than with small ones, if the control is effected by manipulation of the surfaces themselves rather than by movement of the body of the operator.
5. That the head resistance of the framing can be brought to a point much below that usually estimated as necessary.
6. That tails, both vertical and horizontal, may with safety be eliminated in gliding and other flying experiments.
7. That a horizontal position of the operator's body may be assumed without excessive danger, and thus the head resistance be reduced to about one-fifth that of the upright position.
8. That a pair of superimposed, or tandem, surfaces has less in lift proportion to drag than either surface separately, even after making allowance for the weight and head resistance of the connections.

Wilbur's second paper given before the Western Society of Engineers in Chicago on June 24th, 1903, was entitled, "Experiments and Observations in Soaring Flight," and gave particulars of their gliding flights of 1902.

Upon arriving at Kitty Hawk, the boys' first objective was to follow up on Wilbur's soaring idea, endeavoring to increase their time in the air. They picked a hill with a slope a little steeper than 7 degrees, hoping that the winds available would provide sufficient up-current to support the glider. In light winds it was flown as a kite and careful measurements of the wind velocity, angle of attack and lift were made. These were followed by piloted free flights downhill, but they still had lateral control troubles. If a wing went down, the increase of angle of attack by warping, instead of raising the wing was more likely to make it dip further and on numerous occasions dig into the sand. It was Orville who, after a sleepless night, came up with the idea that the trouble was a side slip and that the fixed fin, instead of correcting the adverse yaw due to side slip, was aggravating the condition. He suggested that a movable surface be hooked in with the warping control system to turn this rudder toward the high side and reduce its weather-cock effect. To quote from Wilbur's paper, "With this improvement our serious troubles ended and we devoted ourselves to the work of gaining skill by continued practice."

From then on they made many gliding flights, over half of them in winds of 20 miles an hour and in one case, of 37 miles per hour. During the last six days of flying of the 1902 expedition over 375 flights were made, bringing the total for the season to over 700. The longest glide was 622 feet with a duration of 26 seconds.

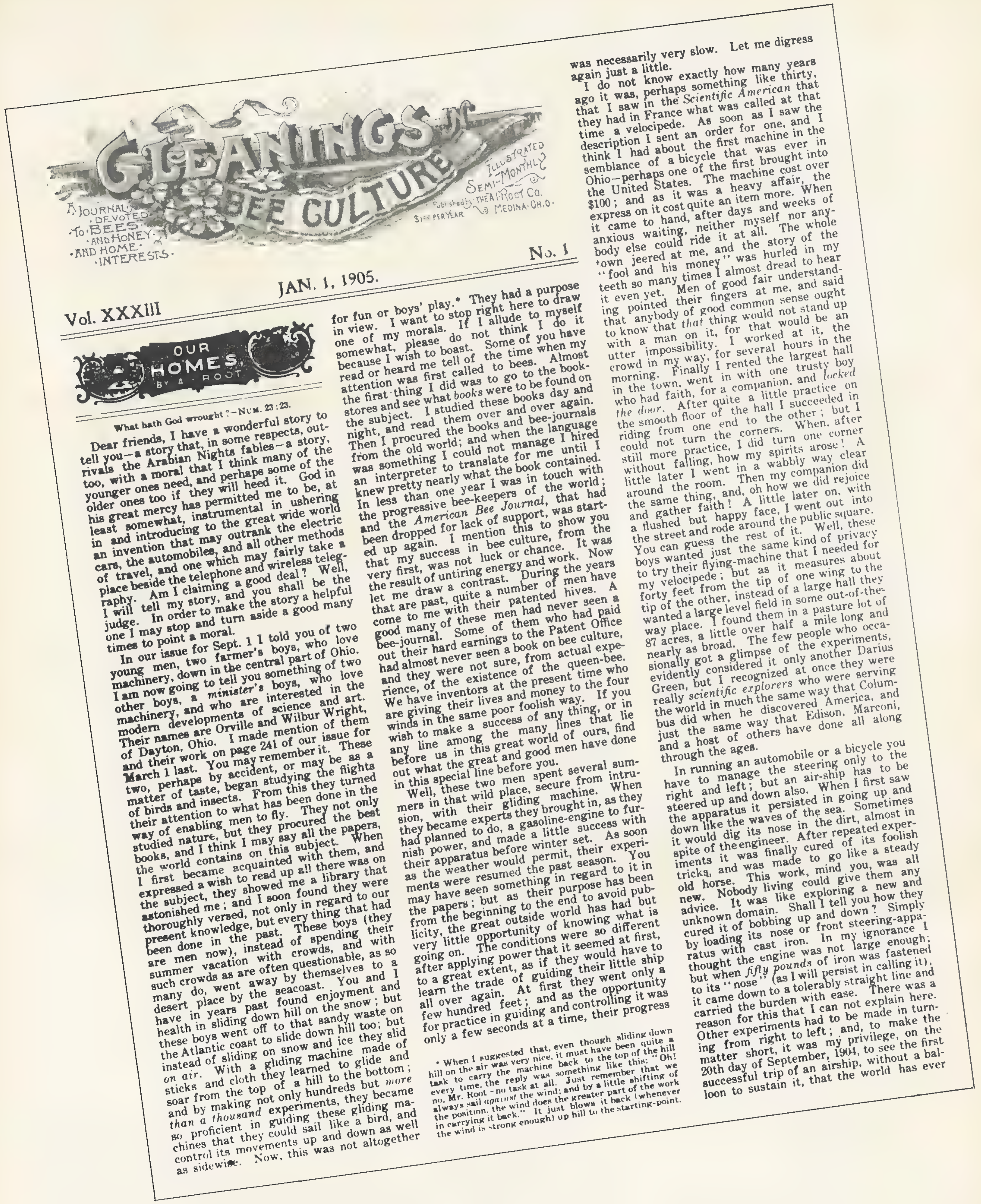
It appears that the best glide ratio was about 8:1 at 22 miles per hour air-speed and 4 to 5 degrees angle of attack.

When the Wrights returned to Kitty Hawk near the end of September, 1903, they brought with them the 1902 glider and the new engine-powered craft, so soon to become the world's first successful flying machine, and for the first few days practiced a bit on the glider, making one flight of 43 seconds. Gliding activity soon ceased so that all effort could go to completing the power machine.

In October, 1911, Orville returned to Kitty Hawk for several weeks. He used a glider to do some experimenting with an automatic control device and to practice soaring. Apparently nothing came of the automatic control at that time, but which was, as I recall, a pendulum type, but his soaring activities were more fruitful. On October 24th he made a soaring flight of 8 minutes, 45 seconds, which stood as an unofficial world's record until German gliding, activity got under way after WW I.

Thus we find that the Wright Brothers were not only pioneers in powered flight, using gliders to perfect their technique and develop their aircraft aerodynamically and structurally, but also were true pioneers in the art and science of soaring flight.

1900 Glider first flown as a kite, with no vertical surfaces.



GLEANINGS IN BEE CULTURE
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OUR HOMES

BY A. ROOT

What hath God wrought?—Num. 23:23.

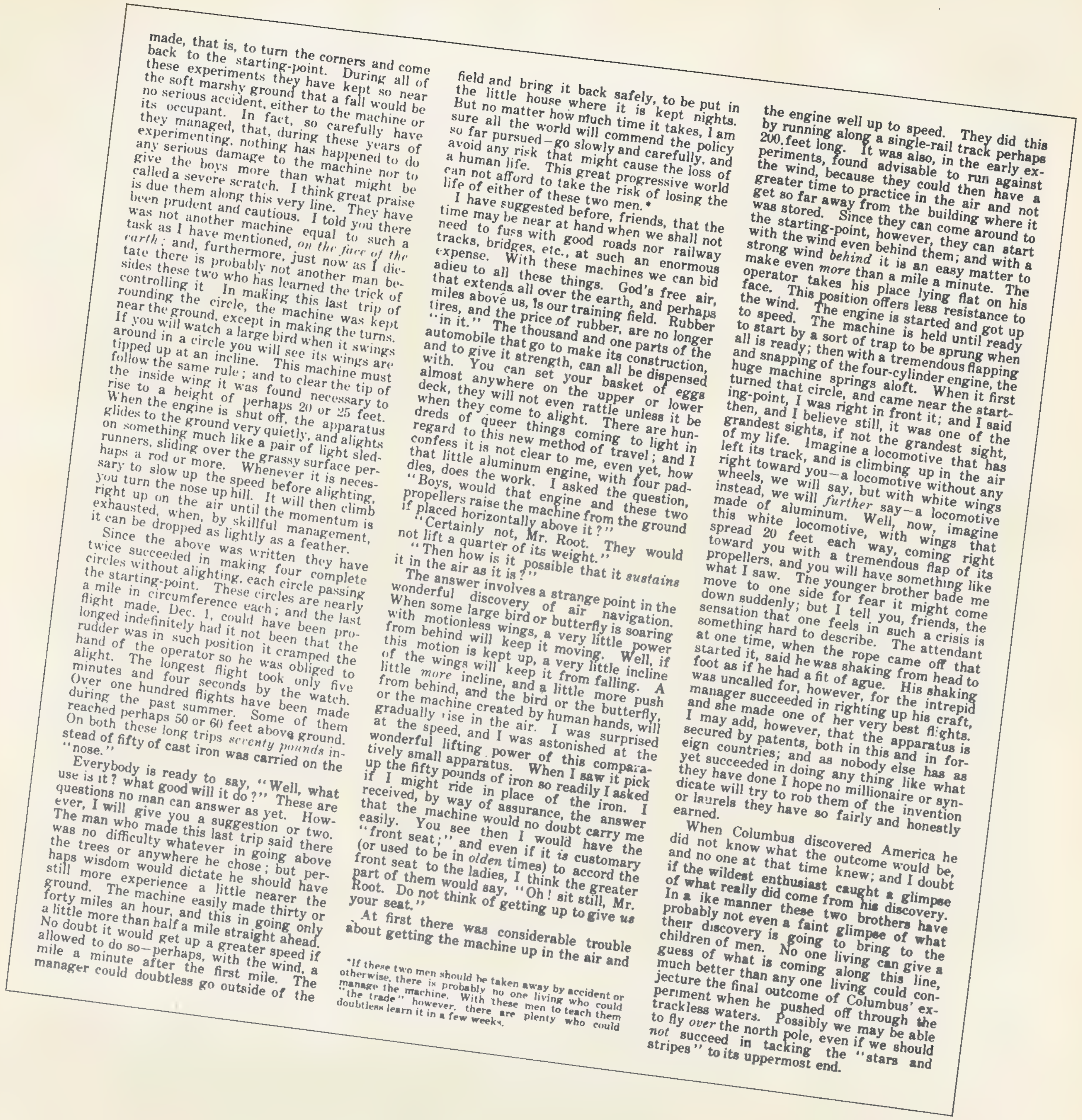
Dear friends, I have a wonderful story to tell you—a story that, in some respects, outrivals the Arabian Nights fables—a story, too, with a moral that I think many of the younger ones need, and perhaps some of the older ones too if they will heed it. God in his great mercy has permitted me to be, at least somewhat, instrumental in ushering in and introducing to the great wide world an invention that may outrank the electric cars, the automobiles, and all other methods of travel, and one which may fairly take a place beside the telephone and wireless telegraphy. Am I claiming a good deal? Well, I will tell my story, and you shall be the judge. In order to make the story a helpful one I may stop and turn aside a good many times to point a moral.

In our issue for Sept. 1 I told you of two young men, two farmer's boys, who love machinery, down in the central part of Ohio. I am now going to tell you something of two other boys, a *minister's* boys, who love machinery, and who are interested in the modern developments of science and art. Their names are Orville and Wilbur Wright, of Dayton, Ohio. I made mention of them and their work on page 241 of our issue for March 1 last. You may remember it. These two, perhaps by accident, or may be as a matter of taste, began studying the flights of birds and insects. From this they turned their attention to what has been done in the way of enabling men to fly. They not only studied nature, but they procured the best books, and I think I may say all the papers, the world contains on this subject. When I first became acquainted with them, and expressed a wish to read up all there was on the subject, they showed me a library that astonished me; and I soon found they were thoroughly versed, not only in regard to our present knowledge, but every thing that had been done in the past. These boys (they are men now), instead of spending their summer vacation with crowds, and with such crowds as are often questionable, as so many do, went away by themselves to a desert place by the seacoast. You and I have in years past found enjoyment and health in sliding down hill on the snow; but these boys went off to that sandy waste on the Atlantic coast to slide down hill too; but instead of sliding on snow and ice they slid *on air*. With a gliding machine made of sticks and cloth they learned to glide and soar from the top of a hill to the bottom; and by making not only hundreds but *more than a thousand* experiments, they became so proficient in guiding these gliding machines that they could sail like a bird, and control its movements up and down as well as sidewise. Now, this was not altogether for fun or boys' play.[*] They had a purpose in view. I want to stop right here to draw one of my morals. If I allude to myself somewhat, please do not think I do it because I wish to boast. Some of you have read or heard me tell of the time when my attention was first called to bees. Almost the first thing I did was to go to the bookstores and see what *books* were to be found on the subject. I studied these books day and night, and read them over and over again. Then I procured the books and bee-journals from the old world; and when the language was something I could not manage I hired an interpreter to translate for me until I knew pretty nearly what the book contained. In less than one year I was in touch with the progressive bee-keepers of the world; and the *American Bee Journal*, that had been dropped for lack of support, was started up again. I mention this to show you that my success in bee culture, from the very first, was not luck or chance. It was the result of untiring energy and work. Now let me draw a contrast. During the years that are past, quite a number of men have come to me with their patented hives. A good many of these men had never seen a bee-journal. Some of them who had paid out their hard earnings to the Patent Office had almost never seen a book on bee culture, and they were not sure, from actual experience, of the existence of the queen-bee. We have inventors at the present time who are giving their lives and money to the four winds in the same poor foolish way. If you wish to make a success of any thing, or in any line among the many lines that lie before us in this great world of ours, find out what the great and good men have done in this special line before you.

Well, these two men spent several summers in that wild place, secure from intrusion, with their gliding machine. When they became experts they brought in, as they had planned to do, a gasoline-engine to furnish power, and made a little success with their apparatus before winter set. As soon as the weather would permit, their experiments were resumed the past season. You may have seen something in regard to it in the papers; but as their purpose has been from the beginning to the end to avoid publicity, the great outside world has had but very little opportunity of knowing what is going on. The conditions were so different after applying power that it seemed at first, to a great extent, as if they would have to learn the trade of guiding their little ship all over again. At first they went only a few hundred feet; and as the opportunity for practice in guiding and controlling it was only a few seconds at a time, their progress was necessarily very slow. Let me digress again just a little.

I do not know exactly how many years ago it was, perhaps something like thirty, that I saw in the *Scientific American* that they had in France what was called at that time a velocipede. As soon as I saw the description I sent an order for one, and I think I had about the first machine in the semblance of a bicycle that was ever in Ohio—perhaps one of the first brought into the United States. The machine cost over $100; and as it was a heavy affair, the express on it cost quite an item more. When it came to hand, after days and weeks of anxious waiting, neither myself nor anybody else could ride it at all. The whole town jeered at me, and the story of the "fool and his money" was hurled in my teeth so many times I almost dread to hear it even yet. Men of good fair understanding pointed their fingers at me, and said that anybody of good common sense ought to know that *that* thing would not stand up with a man on it, for that would be an utter impossibility. I worked at it, the crowd in my way, for several hours in the morning. Finally I rented the largest hall in the town, went in with one trusty boy who had faith, for a companion, and *locked the door*. After quite a little practice on the smooth floor of the hall I succeeded in riding from one end to the other; but I could not turn the corners. When, after still more practice, I did turn one corner without falling, how my spirits arose! A little later I went in a wabbly way clear around the room. Then my companion did the same thing, and, oh how we did rejoice and gather faith! A little later on, with a flushed but happy face, I went out into the street and rode around the public square. You can guess the rest of it. Well, these boys wanted just the same kind of privacy to try their flying-machine that I needed for my velocipede; but as it measures about forty feet from the tip of one wing to the tip of the other, instead of a large hall they wanted a large level field in some out-of-the-way place. I found them in a pasture lot of 87 acres, a little over half a mile long and nearly as broad. The few people who occasionally got a glimpse of the experiments evidently considered it only another Darius Green, but I recognized at once they were really *scientific explorers* who were serving the world in much the same way that Columbus did when he discovered America, and just the same way that Edison, Marconi, and a host of others have done all along through the ages.

In running an automobile or a bicycle you have to manage the steering only to the right and left; but an air-ship has to be steered up and down also. When I first saw the apparatus it persisted in going up and down like the waves of the sea. Sometimes it would dig its nose in the dirt, almost in spite of the engineer. After repeated experiments it was finally cured of its foolish tricks, and was made to go like a steady old horse. This work, mind you, was all new. Nobody living could give them any advice. It was like exploring a new and unknown domain. Shall I tell you how they cured it of bobbing up and down? Simply by loading its nose or front steering-apparatus with cast iron. In my ignorance I thought the engine was not large enough; but when *fifty pounds* of iron was fastened to its "nose" (as I will persist in calling it), it came down to a tolerably straight line and carried the burden with ease. There was a reason for this that I can not explain here. Other experiments had to be made in turning from right to left; and, to make the matter short, it was my privilege, on the 20th day of September, 1904, to see the first successful trip of an airship, without a balloon to sustain it, that the world has ever



made, that is, to turn the corners and come back to the starting-point. During all of these experiments they have kept so near the soft marshy ground that a fall would be no serious accident, either to the machine or its occupant. In fact, so carefully have they managed, that, during these years of experimenting, nothing has happened to do any serious damage to the machine nor to give the boys more than what might be called a severe scratch. I think great praise is due them along this very line. They have been prudent and cautious. I told you there was not another machine equal to such a task as I have mentioned, *on the face of the earth*; and, furthermore, just now as I dictate there is probably not another man besides these two who has learned the trick of controlling it. In making this last trip of rounding the circle, the machine was kept near the ground, except in making the turns. If you will watch a large bird when it swings around in a circle you will see its wings are tipped up at an incline. This machine must follow the same rule; and to clear the tip of the inside wing it was found necessary to rise to a height of perhaps 20 or 25 feet. When the engine is shut off, the apparatus glides to the ground very quietly, and alights on something much like a pair of light sled-runners, sliding over the grassy surface perhaps a rod or more. Whenever it is necessary to slow up the speed before alighting, you turn the nose up hill. It will then climb right up on the air until the momentum is exhausted, when, by skillful management, it can be dropped as lightly as a feather.

Since the above was written they have twice succeeded in making four complete circles without alighting, each circle passing the starting-point. These circles are nearly a mile in circumference each; and the last flight made, Dec. 1, could have been prolonged indefinitely had it not been that the rudder was in such position it cramped the hand of the operator so he was obliged to alight. The longest flight took only five minutes and four seconds by the watch. Over one hundred flights have been made during the past summer. Some of them reached perhaps 50 or 60 feet above ground. On both these long trips *seventy pounds* instead of fifty of cast iron was carried on the "nose."

Everybody is ready to say, "Well, what use is it? what good will it do?" These are questions no man can answer as yet. However, I will give you a suggestion or two. The man who made this last trip said there was no difficulty whatever in going above the trees or anywhere he chose; but perhaps wisdom would dictate he should have still more experience a little nearer the ground. The machine easily made thirty or forty miles an hour, and this in going only a little more than half a mile straight ahead. No doubt it would get up a greater speed if allowed to do so—perhaps, with the wind, a mile a minute after the first mile. The manager could doubtless go outside of the field and bring it back safely, to be put in the little house where it is kept nights. But no matter how much time it takes, I am sure all the world will commend the policy so far pursued—go slowly and carefully, and avoid any risk that might cause the loss of a human life. This great progressive world can not afford to take the risk of losing the life of either of these two men.[*]

I have suggested before, friends, that the time may be near at hand when we shall not need to fuss with good roads nor railway tracks, bridges, etc., at such an enormous expense. With these machines we can bid adieu to all these things. God's free air, that extends all over the earth, and perhaps miles above us, is our training field. Rubber tires, and the price of rubber, are no longer "in it." The thousand and one parts of the automobile that go to make its construction, and to give it strength, can all be dispensed with. You can set your basket of eggs almost anywhere on the upper or lower deck, they will not even rattle unless it be when they come to alight. There are hundreds of queer things coming to light in regard to this new method of travel; and I confess it is not clear to me, even yet, how that little aluminum engine, with four paddles, does the work. I asked the question, "Boys, would that engine and these two propellers raise the machine from the ground if placed horizontally above it?"

"Certainly not, Mr. Root. They would not lift a quarter of its weight."

"Then how is it possible that it *sustains* it in the air as it is?"

The answer involves a strange point in the wonderful discovery of air navigation. When some large bird or butterfly is soaring with motionless wings, a very little power from behind will keep it moving. Well, if this motion is kept up, a very little incline of the wings will keep it from falling. A little *more* incline, and a little more push from behind, and the bird or the butterfly, or the machine created by human hands, will gradually rise in the air. I was surprised at the speed, and I was astonished at the wonderful lifting power of this comparatively small apparatus. When I saw it pick up the fifty pounds of iron so readily I asked if I might ride in place of the iron. I received, by way of assurance, the answer that the machine would no doubt carry me easily. You see then I would have the "front seat;" and even if it *is* customary (or used to be in *olden* times) to accord the front seat to the ladies, I think the greater part of them would say, "Oh! sit still, Mr. Root. Do not think of getting up to give *us* your seat."

At first there was considerable trouble about getting the machine up in the air and the engine well up to speed. They did this by running along a single-rail track perhaps 200 feet long. It was also, in the early experiments, found advisable to run against the wind, because they could then have a greater time to practice in the air and not get so far away from the building where it was stored. Since they can come around to the starting-point, however, they can start with the wind even behind them; and with a strong wind *behind* it is an easy matter to make even *more* than a mile a minute. The operator takes his place lying flat on his face. This position offers less resistance to the wind. The engine is started and got up to speed. The machine is held until ready to start by a sort of trap to be sprung when all is ready; then with a tremendous flapping and snapping of the four-cylinder engine, the huge machine springs aloft. When it first turned that circle, and came near the starting-point, I was right in front it; and I said then, and I believe still, it was one of the grandest sights, if not the grandest sight, of my life. Imagine a locomotive that has left its track, and is climbing up in the air right toward you—a locomotive without any wheels, we will say, but with white wings instead, we will *further* say—a locomotive made of aluminum. Well, now, imagine this white locomotive, with wings that spread 20 feet each way, coming right toward you with a tremendous flap of its propellers, and you will have something like what I saw. The younger brother bade me move to one side for fear it might come down suddenly; but I tell you, friends, the sensation that one feels in such a crisis is something hard to describe. The attendant at one time, when the rope came off that started it, said he was shaking from head to foot as if he had a fit of ague. His shaking was uncalled for, however, for the intrepid manager succeeded in righting up his craft, and she made one of her very best flights. I may add, however, that the apparatus is secured by patents, both in this and in foreign countries; and as nobody else has as yet succeeded in doing any thing like what they have done I hope no millionaire or syndicate will try to rob them of the invention or laurels they have so fairly and honestly earned.

When Columbus discovered America he did not know what the outcome would be, and no one at that time knew; and I doubt if the wildest enthusiast caught a glimpse of what really did come from his discovery. In a like manner these two brothers have probably not even a faint glimpse of what their discovery is going to bring to the children of men. No one living can give a guess of what is coming along this line, much better than any one living could conjecture the final outcome of Columbus' experiment when he pushed off through the trackless waters. Possibly we may be able to fly *over* the north pole, even if we should *not* succeed in tacking the "stars and stripes" to its uppermost end.

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[*] When I suggested that, even though sliding down hill on the air was very nice, it must have been quite a task to carry the machine back to the top of the hill every time, the reply was something like this: "Oh! no, Mr. Root—no task at all. Just remember that we always sail *against* the wind; and by a little shifting of the position, the wind does the greater part of the work in carrying it back." It just blows it back (whenever the wind is strong enough) up hill to the starting-point.

[*] If these two men should be taken away by accident or otherwise, there is probably no one living who could manage the machine. With these men to teach them "the trade" however, there are plenty who could doubtless learn it in a few weeks.

editor's note

With this commemorative issue of the Fiftieth Anniversary of Powered Flight, it was felt that it would be most appropriate to include a reprint of a contemporary article of the time. In searching the records, it was found that little was available; in fact, only three newspapers published any account of this famous flight the morning after it happened. The articles which did appear lacked accuracy and contained many misleading statements. In fact, according to the well-known biography by Fred C. Kelly, entitled "The Wright Brothers," no accurate account of the first flight appeared until a release by the Wrights was published in the newspapers of January, 1904.

It was not until January 1, 1905, that an accurate account of the Wrights' further work appeared in the public press. Then, oddly enough, it appeared in a publication entitled "Gleanings in Bee Culture." Permission was obtained from the present Associate Editor, H. H. Root, to reprint this article, since it is not likely that "Gleanings in Bee Culture" is to be found in the average aeronautical collection. It was written by A. I. Root, who was inspired by the first circular flight which the Wrights made on September 20, 1904.

flights, it puzzled the brothers greatly.

The problem was finally solved by changing to a movable vertical surface. This surface was coupled to the wing warping control in such a way that the rudder worked with the lateral controls to start the turn.

This was the basic control system which the Wrights covered in Patent No. 821393, granted May 22, 1906; and this patent was the foundation upon which they were able to win all of the suits concerning the development of the airplane.

The interdependence of the directional and lateral control is not always recognized today. A good deal of flying instruction time is spent in teaching the co-ordination of the rudder and ailerons. Much of this might have been eliminated had the Wrights and others retained some type of interconnection.

The over 1000 flights made in the two months spent at Kitty Hawk gave the brothers the greatest confidence in their ability to add an engine and construct a successful powered aircraft.

Upon return to Dayton the brothers wrote to several of the best-known automobile manufacturers in an effort to secure a suitable engine for their airplane. None of the manufacturers were able to supply such an engine. The Wrights were therefore forced to construct their own.

Their design efforts resulted in a 4-cylinder horizontal engine built in accordance with current automobile practice. The bore was 4 inches, as was the stroke. The cylinders were individual cast-iron units and were fitted into a single piece cast aluminum crankcase. A camshaft, chain-driven from the crankshaft, operated the exhaust valves and individual breaker points for cylinder firing. The intake valves were opened by natural aspiration and were spring closed. The crankshaft had 5 main bearings and was machined from a solid sheet of armor plate. The rear of the crankshaft had a 26 pound, 15 inch diameter flywheel, to which was fitted a double sprocket to drive the propeller chains. The connecting rods were tubular. Splash lubrication was used.

The ignition while running was supplied by a low-tension generator driven by a friction wheel against the flywheel. Four dry-cell batteries and a home-made inductance coil were in a starter box which was not carried in the airplane. This practice is similar to that currently being used by jet aircraft.

Cooling water was supplied by a long narrow radiator mounted on one of the center section struts. The fuel tank of approximately 3/8 gallon capacity was mounted near the top of another of the center section struts. Fuel was fed to the engine through a rubber hose. There were two valves in the fuel line, the first for metering adjustment and the second for shutting off the fuel flow. This was the only method for stopping the engine.

When the Wrights designed the engine they hoped for about 8-hp but were pleasantly surprised when it developed a little over 12-hp at 1025 RPM. Many engine designers today would like to be surprised the same way! Its weight of 160 pounds dry, and less generator, made it one of the lightest engines of its power available.

It is perhaps fortunate that the brothers were familiar with bicycles. The use of chain drives enabled them to use rather large diameter, slow turning propellers which gave them high thrust at the low flights speeds they were using. In developing these propellers they searched the marine literature available in the Dayton Public Library but could find no information on the theory of screw propellers. The Wrights were forced to develop their own propeller theory in lieu of making large numbers of propeller tests.

Through the theoretical approach they designed two 8-foot diameter propellers which revolved in opposite directions. They were driven at 356 RPM and developed an efficiency of approximately 66%, about 1/3 more than the best achieved by Maxim and Langley, and never approached by any other aeronautical experimenter up to that time.

The airplane into which this motive equipment was placed was considerably larger than anything the Wrights had built before. It had a span of 40 feet, 6 inches, and a total area of about 500 square feet. The front elevators were doubled and incorporated a variable camber with positive camber for nose up and negative camber for nose down. Another innovation which the Wrights used for the first time was covering the top and bottom surfaces of each wing. The wings again had negative dihedral. All controls were similar to those used on the previous glider.

The empty weight of 605 pounds prevented the use of their previous method of launching the gliders by picking them up by the wing tips and running with them into the wind. A 60 foot monorail track was therefore prepared. Most of the craft's weight was carried by a jettisonable dolly. A small wheel made from a bicycle wheel hub was permanently attached to the front skid. Unlike later models of the Wright airplane, no catapult was used. The airplane was held in place by a release cable until the pilot was ready to go.

In the fall of 1903 the Wrights returned to Kitty Hawk with their 1902 glider and their new machine. While they completed the assembly of their new machine they made many practice flights in their old glider.

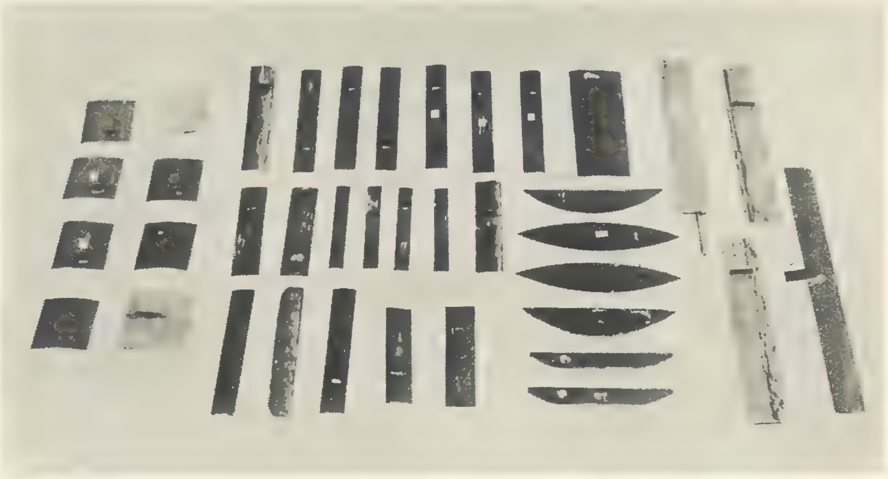
As would be expected, they ran into mechanical difficulties when the engine was started. The propeller shafts failed. These were remade of heavier tubing but after some testing they failed for a second time. Finally after installing some solid steel shafts and overcoming some vibration problems, the airplane was ready to fly on the 14th of December.

Wilbur was elected to make the first attempt, by the toss of a coin, but pulled the airplane up too steeply on the take-off and dropped back to the ground, breaking the front rudder.

Three days later, on December 17, with a 20 to 27 MPH wind blowing, Orville made the first flight, travelling a distance of about 100 feet in approximately 12 seconds. Three other flights were made that day with Wilbur making the best flight of 852 feet in 59 seconds. Some damage was incurred in the landing from this flight and while some repairs were being made to the damaged parts which had been removed from the machine, a gust of wind overturned the craft, damaging it severely. But for this accident the brothers would have tried to fly to the Kitty Hawk weather station about 4 miles away. In reading their accounts of the morning's flights, one feels they might well have succeeded in this attempt if they had modified their elevators. It is apparent that these surfaces were overbalanced and were the source of most of their difficulties that day.

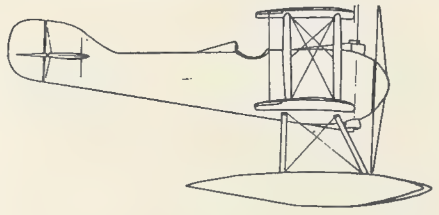
This story of lateral and directional instability, control surface overbalance and powerplant vibration difficulties sounds similar to the development problems one encounters today. There is one thing I am sure of, though - they didn't have to write as many change orders!

So far I have confined myself to telling you of the achievements of the Wrights. Their straightforward and logical development of the airplane leads one to wonder why others were not able to accomplish like results. The Wrights were so far ahead of the other aeronautical experimenters that they were later able to stop their tests for over a year and no others came close to duplicating their feats.



A few of the 350 airfoils tested by the Wrights during the winter 1901-1902.

Supermarine "Sea Lion II" which sparked the 1922 contest, with an average speed of 145.7 M.P.H.



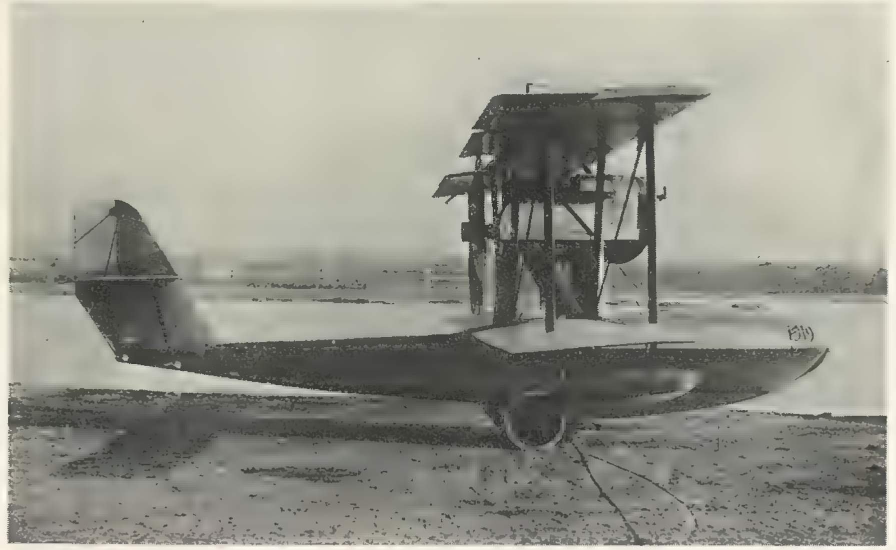
contestants had for Janello.

THE FOURTH SCHNEIDER TROPHY CONTEST, held at Venice, Italy, on September 21, 1920, was almost as unsatisfactory as that held at Bournemouth the previous year. There were no British entries for the contest and France, who had entered, withdrew her entry at the last minute. This left Italy alone, and Luigi Bologna, flying a Savoia S-19 flying boat powered by a 550 hp Ansaldo S. Giorgio engine, successfully completed the course. Flying a triangular circuit of 20 nautical miles he finished the ten laps with an average speed of 107.2 mph. Having attempted to fly the same course on Sept. 19 only to be forced down by poor weather, this was a gratifying win for Bologna and his Savoia.

THE FIFTH SCHNEIDER TROPHY CONTEST, also held at Venice, was represented solely by Italy. France had entered a Nieuport twin float racer piloted by Sadi Lecointe but it unfortunately was wrecked during an attempted takeoff in rough water several days before the contest. On September 7, 1921 the following three entries were lined up for the event:

Zanetti (Italy) Macchi 19
Fiat 700 hp.
Corniglio (Italy) Macchi "Naval Flying Boat"
250 hp Isotta Fraschini
Giovanni de Briganti (Italy) Macchi 7
200 hp Isotta Fraschini

The 1920 Contest winner, the Savoia S-19 flown by Luigi Bologna, which won on the second try.



The course for the event was the same as the previous year (233 miles) and was flown to victory by De Briganti in his Macchi 7 seaplane. Averaging 117.8 mph the Italian was the only one to complete the race. Zanetti had experienced an engine fire on the second lap which put him out of the race and Corniglio had run out of fuel on the 8th lap. Thus Italy held the trophy for the second successive year.

THE SIXTH SCHNEIDER TROPHY CONTEST, organized again by the Aero Club of Italy, was held on August 12, 1922, at Naples. The course was laid out again triangular and covered 13 laps totaling 200 nautical miles. Challengers from France and England were announced but unfortunately the French machines were not ready and it remained for Capt. H. C. Biard, flying a Supermarine Sea Lion II to try and prevent Italy from winning the Trophy three times running and thus permanently. The contestants were as follows:

Capt. H. C. Biard (GB) Supermarine "Sea Lion II"
450 hp Napier "Lion"
Passaleva (Italy) Macchi VII
300 hp Isotta Fraschini
Zanetti (Italy) Savoia 19
450 hp Ansaldo
Vroman (France) C. A. M. S.
300 Hispano Suiza
Teste (France) C. A. M. S.
300 Hispano Suiza

Capt. Biard, in some practice flights at Naples before the actual contest, had flown the course at 140 mph and the Italians were quite optimistic as to their chances for the winning of the trophy permanently. The Supermarine had been prepared for the race through the enthusiasm and cooperation of not only the Supermarine Company, but also the Napier firm, who lent the engine, Shell Oil, who donated all the fuel, and Wakefield, who furnished all the lubricants. The General Steam Navigation Co. even helped transport the seaplane from Southampton to Naples in record time and helped on the triumphant return trip also. All this private effort on the part of the British contender served to show how important the winning of this contest was to the British aviation industry. Capt. Biard was the first away and as the laps were short the Italians were able to estimate his speed as they jockeyed for position at the starting line. Capt. Biard did his first lap at the extraordinary speed of 160 mph and held this time for six laps during which time he overhauled both of the Italian machines. On the 7th through 12th laps Biard eased off on the throttle slightly and allowed Passaleva to reduce the lead somewhat. The Supermarine was lapping just 20 seconds better than Passaleva. On the last round the "Sea Lion II" leaped ahead under full throttle again and won the race at an average speed of 145.7 mph. Two minutes and 31 seconds later Passaleva completed the circuit and close on his heels came Zanetti, three minutes and 23 seconds later. Thus marked the end of a remarkably close race and the regaining of the trophy by the British in an altogether fair and sportsmanlike manner. This individual initiative on the part of Mr. Hubert Scott Paine of Supermarine and Capt. H. C. Biard was a splendid achievement as its results perpetuated the Schneider Trophy for events to come of inestimable value to the progress of aviation.

Our Grahame White school boxkite, the author left, Weber, mechanic at G-W, Percy Robinson (later killed in WWI) A. E. Barrs and an unidentified mechanic.

COURTNEY'S CORNER

EARLY FLIGHT TRAINING

BY FRANK T. COURTNEY

By today's standards of formalized, standardized, licensed, regulated and inspected primary flight instruction, early training methods were certainly crude. But there is no clear evidence that modern methods produce better results, and, to my probably prejudiced eye, there is a lot of vice versa to be detected.

The assortment of schools which operated at Hendon before World War I were fairly representative of the various early training methods. The Grahame-White School, where I learned, used Farman-oid pusher box-kites with Gnome engines of alleged 50 hp. The pilot sat on an outrigger frame in front, with a stick on his right and a conventional foot rudder-bar. In addition to the tail elevator, another elevator was carried on booms in front; whether this was redundant as a control we never knew, but it certainly helped the student with his horizon problems. The engine "throttle" consisted of an ordinary tumbler switch, low on the pilot's left, with which he "blipped" the engine as an idling control. "Carburation" was effected by a small tap, near the switch, which the pilot used to give the engine as much fuel as it seemed to want; if he gave it too much the engine quit, and if he gave it too little the engine quit, and the trick was to keep fiddling with the tap to try and wake up another two or three horses.

Flight instrumentation was furnished by Nature: tachometer services were rendered by the amount of engine noise; the wind on the front of your face was your airspeed indicator, and, on the side of your face, it replaced the ball bank indicator. Altitude, if any, was found by looking down between your feet to see by how much you were missing trees or houses. Rate of climb didn't matter, because there wasn't any.

The student sat in the pilot's seat; the poor instructor sat in a raised seat behind him, and all he could do was lean forward and reach the stick. He had no control whatever over the engine or rudder and his main job was to prevent stalling and to correct landing technique. On rare occasions, when a panicky student went haywire with the rudder or engine switch, the instructor had some spectacular moments.

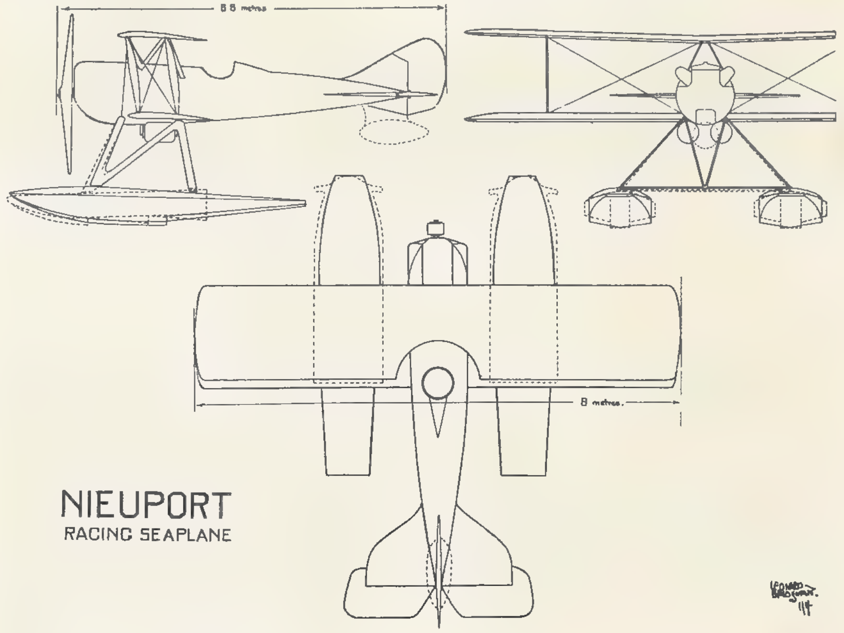
So it is not surprising that "dual" instruction was for straight flying only: you took off at one end of the field, landed at the other end, turned around on the ground, and flew back. When you graduated to "solo" --- you first did "straights" and then "circuits." Since a student's first solo circuit was also his first experience in trying to turn, excitement on the ground and in the air was intense until he headed in for a landing. In those days of light wing loading, the principal idea was to teach the student to get down alive once he had gotten up, so that stalling and landing problems were basic items of training.

The Bleriot School had no "dual" at all. They had three variations of a single-seat monoplane. Two were called "Penguins" with wings clipped so that the first could not even nearly get off the ground, while the second could be stalled off for a few feet so as to return with something resembling a landing. With these two models the student tore around the field, gradually getting used to control action and handling the engine. When he seemed to have had enough of this, he was sent off solo on the third model, which had full-sized wings.

The Wright School used Wright twin-propeller biplanes with the old Wright side-by-side seating, often with the strange arrangement that the instructor's seat was fitted with the early Wright-type controls while the student had a conventional wheel control.

On the ragtime Caudron School anyone was an instructor if the regular one didn't show up, and often a mechanic or shop foreman would happily sit in the second seat and shout at the student what he thought he ought to do. At that, they turned out some excellent pilots and didn't seem to crack up more planes than anyone else - which goes to show something or other.

In those days four hours was a lot of "dual" and generally, in that period, the student learned at least as much basic flying as he now seems to learn in forty hours. That isn't surprising; the student could rely not at all on his engine, his equipment, a nice long runway, a parachute, or the protection of air traffic rules, and not very often on his airplane or his instructor. He was forced to learn to rely on himself, so that he had many advantages over the modern student who must learn to fly with one eye on the ball bank indicator and the other on a book of CAA regulations.



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CONTENTS

Volume 6 **Number 1**

FEATURES

The Birth of Speed (Part Three) by Jack D. Canary 3
The Curtiss Hawk P-1 by Thomas Walker 4

DEPARTMENTS

Courtney's Corner 2

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COURTNEY'S CORNER

HOW FIGHTER PLANES HAPPENED

By Frank T. Courtney

The fighter plane has now long been the glamor-bus of military aviation. It must fly impressively faster and higher than any other craft and its pilot, though he does no more dangerous, skilled or important work than his confreres on bombers, gets individual kudos that other pilots don't get. So it is curious to reflect that the fighter plane, as we know it, was about the only type of aircraft which was not contemplated in the early ideas of military flying, and that the modern type of fighter started off as something quite different.

Throughout the history of war, an army commander has always wanted to get up high to have a look-see at what dirty work his enemy might be up to. For centuries he did his best with towers and hills until, in the Franco-Prussian war of 1870, he was able to use captive gas balloons. When the airplane was first invented, the military mind naturally tended to regard it as virtually a mobile balloon, of use principally for observation and reconnaissance. So the Signal Corps were the first to be seriously interested and the military passenger was then, and for long afterwards, usually called the "observer."

Of course, bombing possibilities were always recognized; if you could get over the top of the other fellow, obviously you could drop something nasty on him. But it was a very long time, as Billy Mitchell so painfully discovered, before the top brass thought much of this.

That there would be fighting in the air was well foreseen; around 1890 the poet Tennyson predicted aerial navies battling in the heavens. But, until fairly well into World War I, the general conception of a fighter plane was something which was inevitably large and slow, something like contemporary ideas of a battleship. First it had obviously to carry a machine-gun, and even one machine-gun with its ammunition was a lot of weight to carry at that time. Then, of course, it had to be a two-seater, because you had to have someone to manipulate and aim the gun; the idea of fixing the gun and aiming with the whole airplane seemed rather silly. Again, a tractor airplane would be unpractical for offensive action, since the gunner-observer could not fire forward through a propeller and a lot of stuts and wires; so the pusher type of airplane, with the gunner up forward, was indicated as the ideal fighter despite its aeordynamic handicaps. So numerous constructors built pusher "gunbuses" of the general class of the F.E. ("Fighter Experimental") models produced at Farnborough.

On the other hand, the fast single-seater developed essentially to carry out the airplane's original duty: observation. It was found that the pilot could observe and make notes as well as fly. Free of the weight of observer and armament, the plane was small and fast enough to get out and back quickly with information, to avoid the slow fighters of its day and, not least, to elude or climb away from ground gunfire in days when 7000 feet was a respectable ceiling for a two-seater. So it was called a "Scout" because scouting was its main job, and it continued to be called a "scout" long after those duties had been forgotten.

The famous little "Bristol Scout" was one of the first airplanes, if not the first, to effect the abrupt but permanent transition from scout to fighter. War experience had soon shown that the regular "fighter" types couldn't catch up with anything to fight, and so a fixed Lewis gun (then a compartively new weapon) was rigged on the Bristol to aim as nearly forward as it could without hitting the propeller, which meant some 30 to 40 degrees sideways from a fore-and-aft line. Poor as the arrangement was, it was found very effecivet, because the "scout" could rapidly overtake an enemy and do some real fighting, even if aiming had to be done the hard way. Enemy aircraft were getting knocked off with regularity, several other aircraft were similarly equipped, and "scout" rapidly same to mean "fighter."

Then in the fall of 1915, came Immelman and his Fokker, with a gun gear which allowed him to fire directly ahead through the propeller, and the single-seater, as the accepted fighter type, was finally established. But the name "scout" died hard, and the designation of one of history's great fighting planes, the S.E.5, meant "Scout Experimental, Model 5."

And, in World War II, history's wheel gave another turn when unarmed fighters, equipped for photo-reconnaissance, again became "scouts."

THE BIRTH OF SPEED

Part Three of THE SCHNEIDER TROPHY RACES

By Jack D. Canary

When Mr. Hubert Scott Paine of Supermarine and Capt. H. C. Biard competed in the 1922 race at Naples, Italy, they were the only group to challenge the superiority of the Italians. Their brilliant victory marked a milestone in the progress of the famous Schneider Trophy Contests as it was the last time in history that a private group with private capital was to win this great international event.

Almost simultaneous with the arrival of the Schneider Trophy at the Royal Aero Club in London came the announcement that the United States Navy wished to participate in the 1923 event. This news was greeted with much excitement in British aviation circles and plans for a 1923 meet proceeded with enthusiasm.

THE SEVENTH SCHNEIDER TROPHY CONTEST organized by the Royal Aero Club was planned for the 28th of Sept., 1923 at Cowes, England. Preliminary flight test accidents, fortunately without fatalities, had eliminated some promising entries. The Sopwith-Hawker biplane crashed when a propeller spinner came loose and the pilot, W. H. Longton, was forced to land in a small field. Lt. Gorton of the USN crashed on alighting in his Navy Wright NW-2 when a propeller blade came loose and damaged both floats. Mr. R. W. Kenworthy of the Blackburn firm unfortunately flipped the new "Pellet" onto its back when it began to porpoise during navigability trials the day before the race. With the withdrawal of Italy the final entries for the event were as shown in Chart 1.

Lt. David Rittenhouse	(USN) Curtiss CR-3 Curtiss D-12, 465 hp.	Racing No. 4
Lt. Paul Irvine	(USN) Curtiss CR-3 Curtiss D-12, 465 hp.	Racing No. 3
Capt. H. C. Biard	(England) Supermarine "Sea Lion II" Napier "Lion" 450 hp.	Racing No. 7
M. Hurel	(France) C.A.M.S. 38 Hispano Suiza 360 hp.	Racing No. 9
Pelletier d'Oisy	(France) C.A.M.S. 36A Hispano Suiza 360 hp.	Racing No. 10
M. Duhamel	(France) Latham L.1 Two Lorraine Dietrich 400 hp.	Racing No. 11

Chart 1

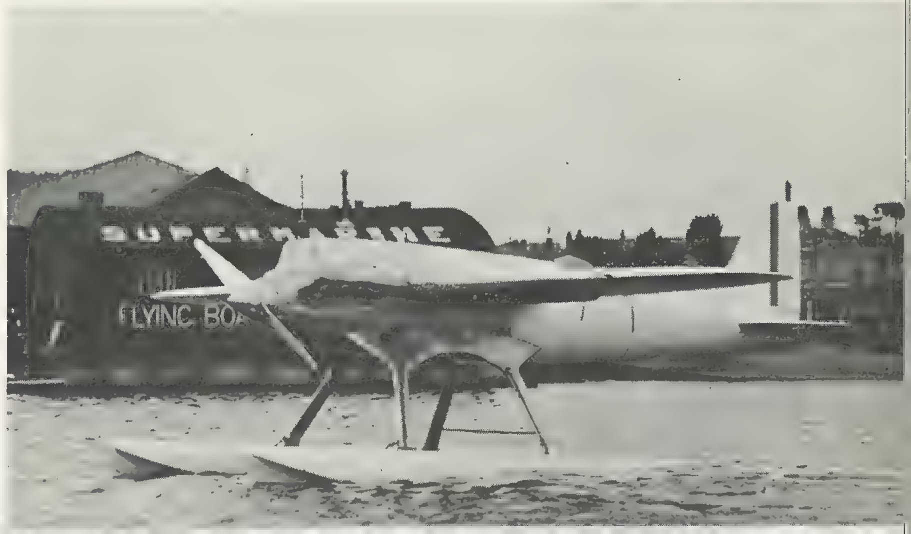
Of the six competitors left in the race, only four actually participated. These started in the following order: The two U. S. Navy Curtiss CR-3s were sent off first, 15 minutes later Biard took off in his Supermarine. To everyone's surprise Lt. Rittenhouse appeared in his diminutive Curtiss racer and banked steeply by the Supermarine as it crossed the starting line. Barely 20 seconds later the other member of the United States Navy team, Lt. Irvine, roared by and disappeared after his teammate. The French team was then signalled to start but only Hurel in the C.A.M.S. 38 got away successfully. Both of the other two French entries failed to become airborne, one fouling a buoy and the other having engine trouble.

Shortly after Hurel in No. 9 started his first lap, Capt. Biard appeared and rounded the mark boat for a total time of 17 min. 11 sec. on his first lap. Averaging just over 14 min. per lap, it was obvious that the American entries had the superior speed. Unfortunately Hurel was forced down shortly after the beginning of his second circuit and the race settled down into a battle between Lt. Rittenhouse and Lt. Irvine with Capt. Biard running a steady third. With superb skill Lt. Rittenhouse piloted his Curtiss CR-3 to victory at an average speed of 177.38 mph. Lt. Irvine was second at 173.46 mph and Capt. Biard third at 151.16 mph. Thus the Schneider Trophy was destined to come to America for the first time. The British aeronautical weekly "Flight" had this to say about the 1923 contest, "We congratulate America on her win and above all we congratulate the American aircraft industry on being fortunate enough to have a government which realizes the importance of aeronautical development of State support for participation in International aviation events."

THE EIGHTH SCHNEIDER TROPHY CONTEST took place at Bay Shore Park, Baltimore on Monday, Oct. 26, 1925. The previous year no entries other than the United States had been announced so the National Aeronautics Association had decided to postpone the race one year to enable foreign competitors to complete and flight test their machines. On the Friday before the race, Oct. 23, the navigability trials were held and two of the most promising British entries met with trouble. One was the Supermarine S-4 flown by H. C. Biard and the first of a line of high performance seaplane racers designed by R. J. Mitchell, sleek, full cantilever mid-wing monoplane had performed well in preliminary flight tests and was a distinct departure from the conventional seaplanes seen at previous races. Becoming unmanageable during some high speed runs at low altitude Capt. Biard was barely able to retain control and crashed during an attempted landing. Luckily Capt. Brod was close by in his Gloster III and he quickly taxied to the scene of the crash and threw Biard his life preserver. This kept the plucky Biard afloat until rescued but the plane was so badly damaged it was never repaired. Bert Hinkler in another Gloster III had brace wire troubles and on trying

(continued on page 8)

Novel Supermarine S-4 of 1925, first of R. J. Mitchell's famed seaplane racers.



THE CURTISS HAWK P-1

by Thomas Walker

Illustration by Frank Germain

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Prior to 1924 the Army Air Service utilized two or three letter symbols to designate its aircraft. Pursuits (or Fighters) were identified as PW (Pursuit-Watercooled), PA (Pursuit-Aircooled) and various other symbols, such as PN, PG and TP that never reached the production stage.

Despite the fact that in 1924 the Army Air Service adopted the simplified system which still exists today with some modifications, the PW types were produced through 1927. Quite frankly, the PW-1 to PW-7 belonged to the World War I fraternity in appearance, and not until the advent of the Curtiss XPW-8 in 1923 did American fighter aircraft begin to appear sleek and relatively streamlined.

The Curtiss PW-8, developed from the R-6 racer of 1922, was the immediate predecessor of the "Hawk" series. Some of its characteristics are tabulated below:

Engine Curtiss D-12	420 H. P.
Power Loading	7.54 lb. h. p.
Wing Span	32′ 0″
Wing Loading	11.33 lb. sq. ft.
Length	23′ 1″
Gross Weight	3167 lb.
Top speed, sea level	170 mph
Top speed, 20,000 ft.	127 mph
Rate of climb, sea level	1850 ft/min
Service ceiling	20,000 ft.
Endurance at top speed at 10,0000 ft.	2-3/4 hours

The lack of any visual radiator for the engine coolant can be attributed to the brass ribbed wing radiators that extended for 13′ on the upper span. Although aerodynamically superior to the tunnel type radiator, it was not conducive to good field maintenance and was discarded on the PW-8A. The remainder of both upper and lower wings were plywood covered. In plain view the wings were elliptically tapered from a distance 6½ ft. inboard from the upper wing tip. Wing construction was multicellular, consisting of a series of small spars normal to the ribs, and resulting in a pattern of squares when observed in plan view and without the plywood covering. Two .30 calibre machine guns fired through a two-bladed Curtiss-Reed dural prop, with the assistance of a synchronizer gear. The empennage and aileron structure were also of dural cloth covered. An internally housed, but droppable fuel tank was employed as a fire deterrent in case of forced landings.

Experiments were conducted on a PW-8 that carried a high compression Curtiss D-12 engine of 460 h.p., utilizing a 50-50 mixture of benzol and gasoline. With this engine a top speed of 180 mph was attained, and a service ceiling of 24,000 ft.

The Curtiss PW-8A, a modified XPW-8, incorporated a tunnel radiator in place of the wing radiators, eliminated a set of interplane struts, and reduced the wing span from 32′ to 30′. This plane was the fastest of the PW series, a top speed of 178 mph at sea level being attained with the same Curtiss D-12 engine of 420 h.p.

The XPW-8B introduced the distinctive tapered wing that characterized the "Hawk" series. Still featuring the Curtiss D-12 engine of 420 h.p., the XPW-8B had a span of 31′ 6″, length of 22′ 2″, a gross weight of 2800 lb. and a top speed of 167 mph at sea level, service ceiling 24,000 ft. Only one of the PW-8B design was produced, having been converted from an -8A model. However, approximately 100 "Hawks" of this type were manufactured under the new designation for pursuit aircraft adopted in1924.

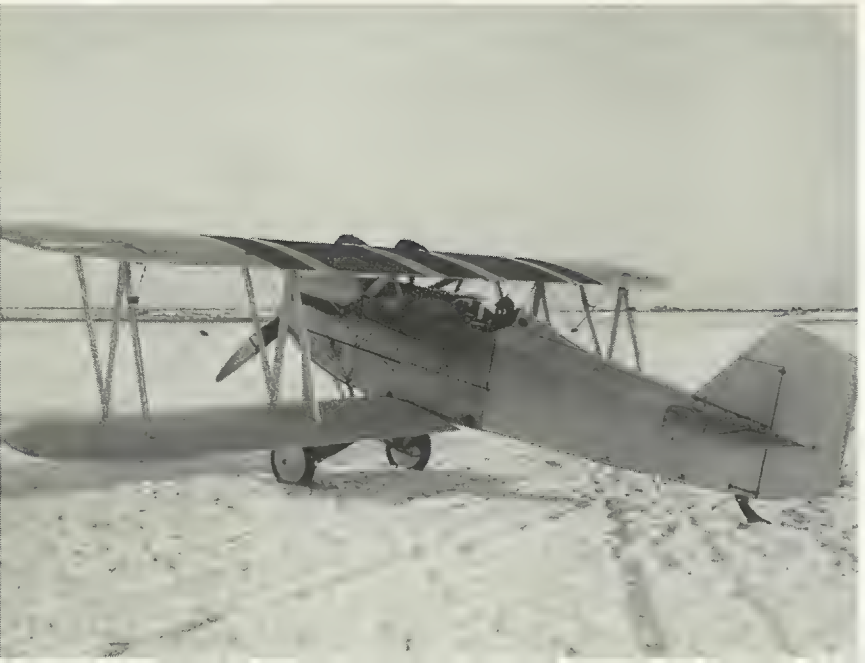
The same year the PW-8B appeared, the Army Air Service adopted a new system of aircraft designation, and the first of the pursuit airplanes to be accepted under this classification was the Curtiss P-1 Hawk, a 1925 refinement of the PW-8B. The P-1's fuselage consisted of steel tubing, fabric covered, with the exception of the engine cowling. Wing construction was conventional two spar, wood type. Steel tubes were utilized for the main empennage structure, supplemented by dural ribs and secondary spars. Fabric covered all wing and tail surfaces. The auxiliary belly tank of 50 gallons was nickel plated aluminum. Early model P-1's mounted a Curtiss-Reed duraluminum propeller, factory twisted into the proper pitch, although later models utilized a forged type.

The Curtiss P-1 shaped up as follows:

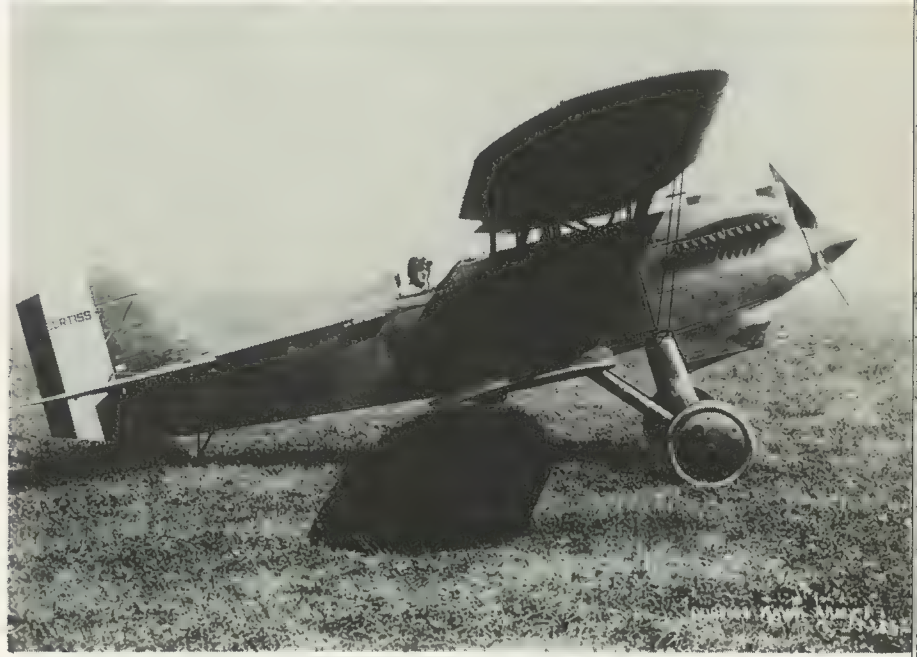
Engine	Curtiss V-1150 (D-12) of 450 h.p.
Span	31′ 7″
Length	22′ 10″
Gross Weight	2846 lb.
Wing Loading	11.29 lb. sq. ft.
Power Loading	6.32 lb. per/h.p.
Fuel Capacity	50 gallon main tank, 50 gallon auxiliary tank (external)

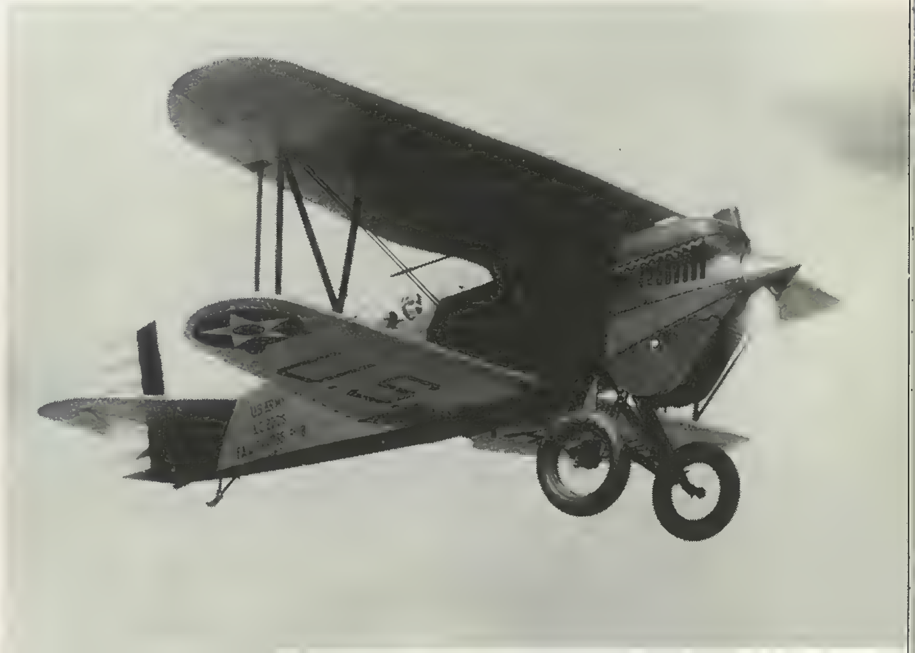
Performance figures compiled during an official performance test at Wright field on August 17, 1925 were:

Top Speed— sea level	163 mph
Top Speed— 20,000 ft.	135 mph
Climb—initial	1315 ft. min. to 6500 ft
Climb—altitude	7.2 min. to 10,000 ft. 13.0 min. to 15,000 ft. 24.0 min. to 20,000 ft.
Service ceiling	22,500 ft.
Absolute ceiling	23,800 ft.



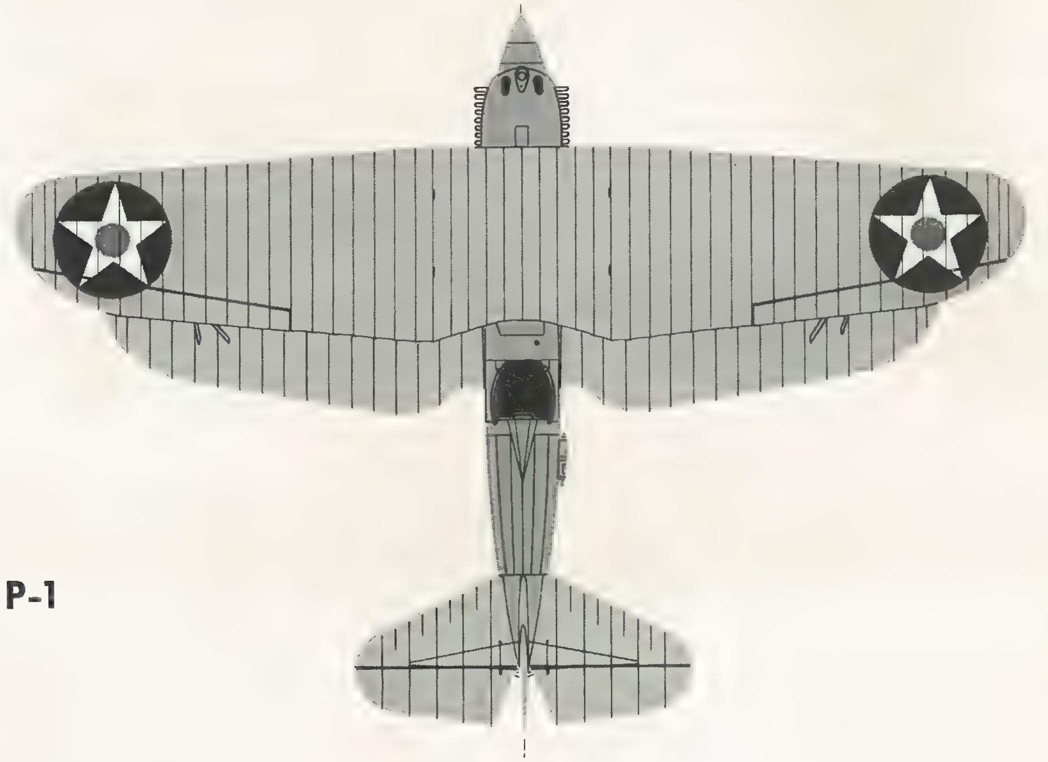
The Curtiss XPW-8 was predecessor of the successful series of "Hawk" fighters. The wing-skin radiators and wing plan form, shown here, indicate influence of earlier R-6 racer.





Formal portrait of the Curtiss P-1 (upper right) provides a marked contrast with the saucy in-flight scene of a wire-wheeled P-1, resplendent in the squadron markings of the day.

CURTISS HAWK P-1



Wright in-line engine powered the Curtiss AT-4 (above), an early advanced trainer developed from the P-1 series. The AT-5 was similar, but had Wright J-5 radial engine. Sharp-nosed YP-23 (below), the final Army "Hawk" design, was a modification of the last production P-6E.

The P-1 graduated into the P-1A type with only minor changes, and the new model reached squadron status in 1926.

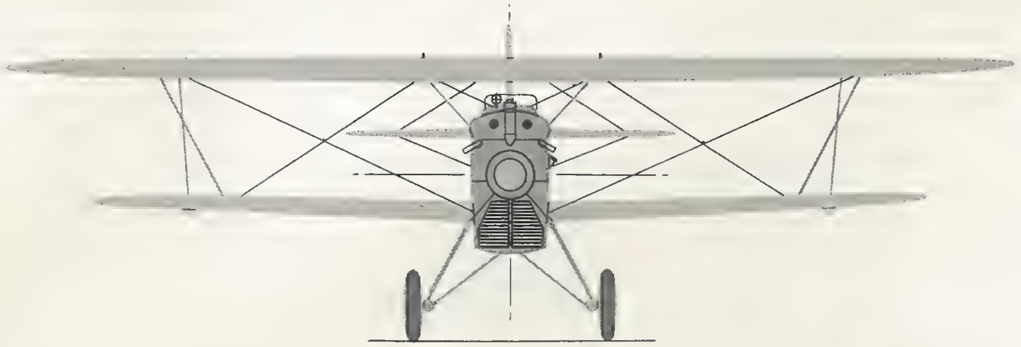
Although the P-1A was more maneuverable than the PW-8 and required less maintenance, it was soon apparent that some modifications were required to improve the serviceability of the airplane. The small tires (28″ x 4″) and spoked wheels of the P-1A were not adequate for rough landings, and they constantly failed during drop tests conducted in 1926. Larger tires (32″ x 6″) and disc wheels were incorporated into the design of the P-1B, as well as a longer and more streamlined radiator, which featured improved shock mounting, to reduce vibrations and the resulting high percentage of leakage encountered in the P-1A. A redesigned pilot's seat, lengthened control stick, V-1150D engine and a different throttle location were also included in the P-1B model, which had a top speed at sea level of 160 mph, tapering down to 132 mph at 20,000 ft. The P-1C added wheel brakes and a slightly modified Curtiss D-12 engine.

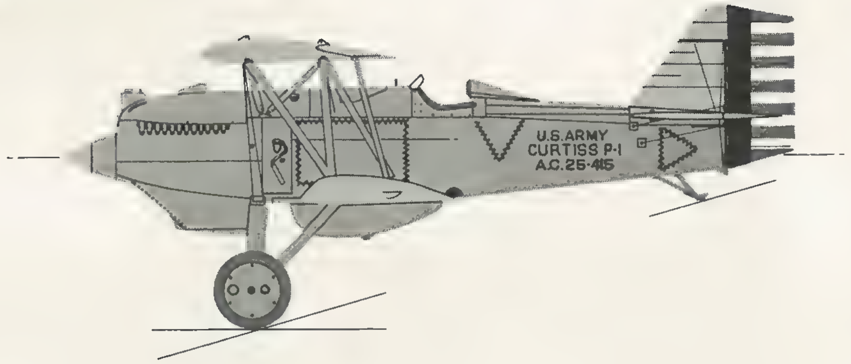
On July 2, 1926, the Army Air Service became the Army Air Corps. The creation of the Army Air Corps did not affect the procurement of Curtiss Hawks adversely, and in addition to the ten P-1's and twenty-five P-1A's purchased by the Air Service, twenty-five P-1B's and thirty-three P-1C's were procured by the Air Corps in 1927 and 1928.

One of the selling points of the P-1 series was its adaptability to an advanced trainer type by the expedient of installing a Wright E4 engine of 180 h.p., which was interchangeable with the Curtiss D-12 (The Wright E4 was a refinement of the World War I Hispano-Suiza.) Seventy-one of the AT-4's and AT-5's, as the trainer versions were designated, were manufactured in 1927 and 1928, fifty-two were converted to Pursuits as P-1D's, E's and F's, possibly due to lack of funds for the procurement of additional pursuit aircraft. The D's, E's and F's were heavier and slower than the earlier P-1's, but the serviceability and safety of the airplane probably improved.

The Navy also purchased a number of Hawks under the designation of F6C-1, -2 and -3. These planes were almost identical to the Army P-1's, with the exception of cross axle landing gear for carrier landings.

Improvements and modifications to the Curtiss Hawks resulted in an extensive series of aircraft that culminated in the YP-23 of 1933. This model was not only the last of the Army Air Corps Hawks but the last of the Biplane Era of fighters for the Army. (*To be continued.*)





SCALE

IAS FEATURES PAGEANT OF TRANSPORT AIRCRAFT DISPLAY

"The Pageant of Transport Aircraft," a special exhibition depicting the history of commercial airplane development, was recently displayed in New York at the Aeronautical Museum of the Institute of the Aeronautical Sciences.

The exhibit included models, photographs, cut-aways, and other items that portrayed the progress of the transport airplane. Material for this special display, which was open to the public, was provided by five of the nation's principal builders of airliners and five major air carriers. The manufacturers which contributed to the exhibition were: Boeing Airplane Company; Consolidated Vultee Aircraft Corporation; Douglas Aircraft Company, Inc.; Lockheed Aircraft Corporation; and The Glenn L. Martin Company. Participating airlines were: American Airlines, Inc.; British Overseas Airways Corporation; Eastern Air Lines, Inc.; Trans World Airlines, Inc.; and United Air Lines, Inc.

(continued from page 3)

to requalify the morning of the contest he washed out both floats in rough water. The final entries for the 8th contest are listed in chart 2.

Lt. James Doolittle	(USN) Curtiss R3C-2 Curtiss V-1400 600hp.	Racing No. 3
Lt. G. T. Cuddihy	(USN) Curtiss R3C-2 Curtiss V-1400 600hp.	Racing No. 4
Lt. Ralph Ofstie	(USN) Curtiss R3C-2 Curtiss V-1400 600hp.	Racing No. 1
Capt. Hubert Broad	(England) Gloster III Napier Special 700 hp.	Racing No. 5
Giovanni de Briganti	(Italy) Macchi M-33 Curtiss D-12 500 hp.	Racing No. 7
Lt. Morselli	(Italy) Macchi M-33 Curtiss D-12 500 hp.	Racing No. 6

Chart 2

Of the final six competitors only Lt. Morselli in his Machhi M-33 failed to start. Lt. Doolittle was the first away in his Curtiss R3C-2 and at five minute intervals Broad, Cuddihy, Ofstie and de Briganti got away. Lt. Ofstie retired in the sixth lap with a siezed engine after the sixth lap with a seized engine after averaging 215 mph and his teammate had the heartbreaking experience of running out of fuel less than a mile from the finish line on his last lap. Lt. Cuddihy's speed was 220.45 mph average which would have placed him second had he completed the race. Lt. Doolittle, in a display of precision flying that was outstanding, flashed by each marker boat with inches to spare and completed the course at an average speed of 232.573 mph to win the contest. Capt. Broad in the tiny Gloster III placed second at 199.169 mph and the plucky Italian de Briganti finished third at 168.444 mph. Thus America had, for the second time, won the trophy decisively.

THE NINTH SCHNEIDER TROPHY CONTEST, also organized by the NAA, was held at Hampton Roads, Virginia on Nov. 13, 1926. Victory having fallen twice already, within three years, to America made the 9th race of international interest to see if she would be able to hold it "for keeps." Unfortunately, although the British Air Ministry was anxious to assist in regaining the Trophy, it was found that it would be impossible to complete a team of challengers in time for the contest. Thus the only foreign entries were three sparkling sleek red Macchi M-39s fresh from the Schiranna Air Station in Italy. The American racers were essentially cleaned up versions of the previous years' machines with more power and better streamlining. The preliminary trials were held on Nov. 10th, 11th and 12th during which the Curtiss R3C-3 piloted by Lt. Tomlinson pancaked into the water on a landing and was damaged beyond repair. Powered by a Packard V-1500 engine of some 700 hp high hopes had been held for this plane and its loss was deeply felt by the American team. Lt. Tomlinson obtained a practice Curtiss Hawk F6C-1 and managed to qualify although hopelessly outclassed by the Macchi M-39s. The final entrants for the contest were:

The first away the day of the contest was Lt. Bacula in his blood red Macchi M-39. At five minute intervals Tomlinson, Cuddihy and Ferrarini took off. At this point, even before the last two entrants, de Bernardi and Schilt, could become airborne, Bacula roared by completing his first lap at an average speed of 209.5 mph and immediately behind him came Cuddihy at a noticeably faster speed. This gave some hope to the American team but when de Bernardi started circulating the course at speeds over 240 mph their hopes again were dashed. Ferrarini experienced engine trouble and alighted safely with a broken oil line on his fourth lap. Major de Bernardi's best lap was his third at 248.5 mph while the best American effort was Lt. Cuddihy's fifth lap at 242.1 mph. Bad luck again dogged Cuddihy, however, when on his seventh lap his fuel pump failed and he was forced to retire from the race. The winner was Major Mario de Bernardi at an average speed of 246.496 mph. Lt. Schilt was second at 231.363 mph and Lt. Bacula was third at 218 mph. Lt. Tomlinson flew the entire course in his Curtiss Hawk F6C-1 and at an average speed of 136.953 placed fourth.

Major Mario de Bernardi	(Italy) Macchi M-39 Fiat AS.2 800 hp.	Racing No. 5
Capt. Arturo Ferrarini	(Italy) Macchi M-39 Fiat AS.2 800 hp.	Racing No. 3
Lt. Andiano Bacula	(Italy) Macchi M-39 Fiat AS.2 800 hp.	Racing No. 1
Lt. G. T. Cuddihy	(USN) Curtiss R3C-4 Curtiss V-1550 700 hp.	Racing No. 4
Lt. C. F. Schilt	(USN) Curtiss R3C-2 Curtiss V-1400 600 hp.	Racing No. 6
Lt. Tomlinson	(USN) Curtiss F6C-1 Curtiss D-12 450 hp.	Racing No. 2

Chart 3

The Macchi Company and Ing. Castoldi, the firm's chief designer, deserved every congratulation for their well deserved success. To achieve this victory, they had, with broadness of mind, incorporated all the good points of previous high speed aircraft in a design which was a complete departure from their previous aircraft policy, that is, the development of the flying boat. The news of the Italian victory gave England new hope and most important of all, State support for an accelerated high speed flight development program. Aircraft speeds were climbing steadily with the stimulus of international competition. The next Schneider Contest was eagerly awaited by air minded people everywhere. *(To be continued)*

Italy's Macchi M-39 won 1926 Schneider contest; later set world speed mark.

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CONTENTS

Volume 6 **Numbers 2 & 3**

FEATURES

The Hawk Series (Part Two) by Thomas Walker 3
Tom Benoist by Christy Magrath 4
The Magellans of the Air by R. L. Bliss 6

DEPARTMENTS

Aerial Post 2

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AERIAL POST

To The Editor, "Aeronautica":

Thank you sincerely for the ten copies of the December issue of "Aeronautica," containing the account by Father of the Wrights' early experiments. We shall be able to use these to good advantage, for we are still getting inquiries.

Yes, A. I. Root was my father. There is one instance that I remember very well, for it made such a vast impression on Father that when he came home he could talk of little else. He was never at Kitty Hawk but on several occasions he visited the pasture near Dayton where the Wright brothers were making their tests.

Father knew of their experiments with a rudder, and to his great delight was present the first time that they succeeded in bringing the plane back to the approximate starting point. I do not now recall which brother operated the plane on that occasion but whichever one it was, he was very indignant because the other, noting some looseness in the ignition switch, had shorted it and had forgotten to mention the fact. The pilot was insisting that there might have been a serious accident because he could not shut off the motor, but in the midst of their talk, Father called their attention to the fact that they had succeeded in coming back to the starting point. In their argument, they had forgotten that and both of them burst out laughing because they had overlooked the success of their control.

This little story I do not recall has ever appeared in print, although I might be wrong about that. However, I heard Father tell it so often that I am sure I have passed it on to you in substantially the same words that Father used fifty years ago.

In view of the very general skepticism which the Wright brothers met at first, it has always seemed quite wonderful to me that Father had, from the very beginning, such great faith in these "boys," as he called them. However, he was a great judge of character and believed in them because he had seen with his own eyes the performance of the Wright ship while scientists, in general, doubted the whole story.

Yours very truly,
H. H. ROOT,
President,
The A. I. Root Co.
Medina, Ohio

To The Editor "Aeronautica":

The enclosed snap shot is a Polaroid, so not very good.

I did however want you to see a 1912 interplane aileron Curtiss pusher replica built 1947 which I acquired last month.

This job is really a dream boat. The wings are as near Curtiss's as possible, laminated wood ribs etc.

Welded steel replaces bamboo and wood in the frame, booms, landing gear etc. Power is an 75 Continental, modern wheels and hydraulic brakes. Instrument panel by pilot's right thigh. Cub controls and fittings. Standard cable wires instead of piano wire. Glenn never had it so good.

It has an X license. Been flown 40 hours including two 150 miles cross countries. Takes off at 35, cruises 50. 25 gal tank. Range over 150 miles.

Because of the interplane ailerons it looks just like Lincoln Beachey's job in all his famous photos when flying. It doesn't fly like a Cub with the Curtiss wings and no stabilizers but it flies safe and reliable if you understand its limits. Requires no maintenance and there is no danger of airframe or engine or control failure.

It was built by Walter Bullock, a student of original Newport News Virginia, Glenn Curtiss flying school. Bullock, an early bird about 59, is a senior Captain today in the Orient, flying Northwest Stratocruisers. He built this replica in 1947 in Minneapolis and it is a real work of art, particularly the welding.

Have some wonderful 3-D color Stereo Realist shots of it, in flight also. Ship is located at Des Moines Municipal Airport now. We will make some hops in it this fall, later on.

Regards,
E. D. "HUD" WEEKS.
Des Moines, Iowa

By the way, I'm still interested in Bleriot and Wrights. I had a long visit this summer with Charles Wiggin, now married to Mrs. Cal Rogers of Vin Fizz fame. Both in fine health. Wiggin was mechanic and went on the entire trip. Wiggin wants someone to do something with the Cal Rogers story.

HUD.

1912 CURTISS PUSHER

THE HAWK SERIES

Part Two

By Thomas Walker

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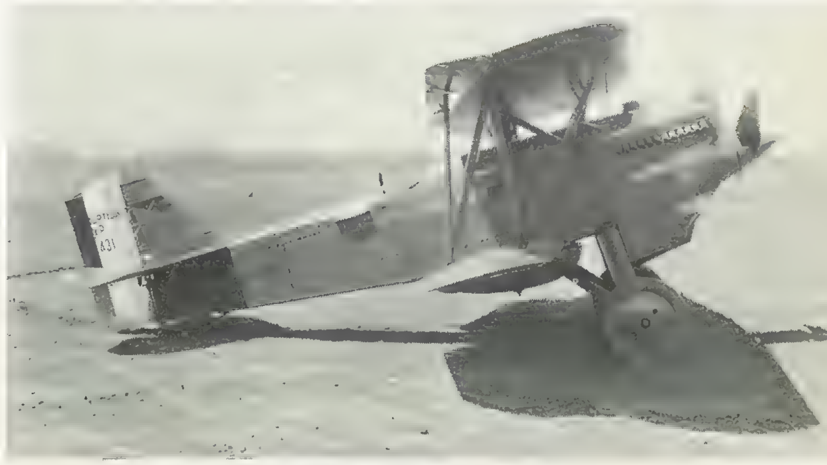


P-2 Hawk was modified P-1 with V-1400 engine of 500 H.P.

In 1925 Curtiss produced the V-1400 engine, a 500 h. p. model as compared with the 435 h. p. developed by the V-1150 (D12) installed in the P-1. The V-1400 was narrower than the V-1150 but incorporated a heavier crankshaft than earlier designs, together with a new type magneto and special carburetor airscoop. The new engines were installed in five P-1A's, the airplanes being redesignated P-2. The P-2 was 10 mph faster than the P-1 and had a greater climb and ceiling.

In official performance tests on December 4, 1925, the P-2 exhibited a top speed of 172 mph at sea level, 162 mph at 10,000 ft., and 130 mph at 20,000 ft. Service ceiling was 22,950 ft., absolute ceiling 24,000 ft. Initial climb was 1,590 ft./min., 10,000 ft. was reached in 6 minutes, 20,000 ft. in 19.7 min. The gross weight for this flight was 2,869 lbs.

The development of the turbo supercharger had advanced to the point where flight testing under Army Field Service conditions was desired. The P-2 was one of the airplanes chosen for this work and the necessary modifications were undertaken to install the turbo. A larger radiator than that utilized in the P-1 was installed plus an auxiliary radiator (intercooler) to lower the temperature of the compressed air passing from the turbo to the carburetor. To protect the pilot from the low temperatures encountered at altitude, the cockpit was lined with insulating material and heated by air ducted through a jacket around the exhaust manifolds. Oxygen equipment and a cockpit cape that protected the pilot from the icy winds completed the program. Added design features were hydraulic brakes and a series of rubber discs attached to the upper end of the landing gear struts to absorb landing impacts. All this added up to considerable weight, and consequently the top speed of this P-2 model was reduced at sea level. However as the supercharged P-2 climbed to altitude its speed increased, and it was probably the fastest aircraft in the world in 1927 at 20,000 ft.

The experiments in supercharging this type aircraft were relatively successful, since it was apparent that if a dependable turbo could be developed, high altitude performance would be considerably enhanced. Accordingly, the Army Air Corps procured (5) Curtiss P-5s in 1927 to continue this work.

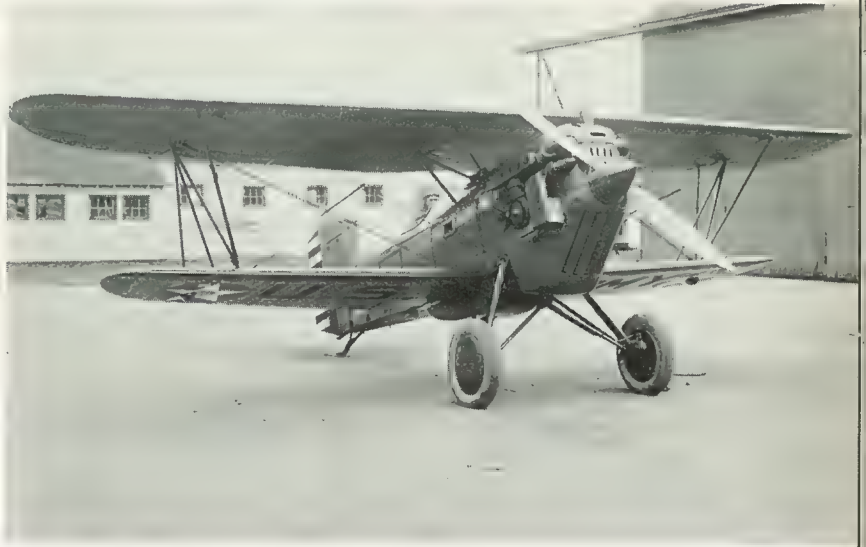
The P-5 incorporated a 435 h. p. Curtiss V-1150-3 engine, the same type that powered later model P-1s. The 3340 lb P-5 was much slower than the P-1, at sea level, but like the P-2, it could move at altitude. According to Army Test AC-28-189, here is its performance.

Sea Level	144 mph
5000 ft.	151.3 mph
10,000 ft.	158.5 mph
15,000 ft.	165.4 mph
20,000 ft.	171.8 mph
25,000 ft.	173 mph

The P-5 Hawk climbed to 20,000 ft in 10 minutes, phenomenal in that day! A service ceiling of 31,900 ft. and an absolute ceiling of 32,500 ft. also attested to its fine altitude performance. At 25,000 ft. and at full throttle the P-5 Hawk had a range of 210 miles.

One of the most controversial subjects in the aircraft industry and military services prior to the introduction of jet engines was the relative superiority of the in-line, liquid-cooled engine versus the radial, air-cooled type. With the introduction of glycol cooling in 1931, and its accompanying smaller radiators, the superior aerodynamic characteristic afforded by the in-line engine offset to a great degree the relative weight per horsepower advantage and reliability of the radial type. But in 1926, when the Army Air Corps was experimenting with its first radial engine fighter, the Curtiss XP-3, in-line engines were water-cooled and had pronounced disadvantages. Maintenance records of Army aircraft during the 1920's indicated that approximately 50% of the

(continued on page 12)



Supercharged P-5 had 2000 feet a minute climb at sea level.

TOM BENOIST--ONE OF FLYINGS ALL TIME GREATS

by

Christy C. Magrath

NOTE Christy Magrath is a dean among aircraft model builders and historians having had a total of 36 years experience. Among his many models on display throughout the country is the Diorama of mans first successful powered flight on display in IAS New York Headquarters and the "Antoinette" model in the W. F. Durand Museum.

Mention the name of Tom Benoist to Mr. Average Citizen, and he will probably give you a quizzical look and say "Who's he?" Mention the name of Wright to him and he may answer, "Oh yeah, couple bicycle mechanics one of 'em named Orville, I think, that flew the first airplane at some place called Kitty Hawk." Ask if he ever heard of Curtiss and you might get something like this: "Curtiss? He was an airplane feller too, wasn't he?"

You can't blame Mr. Average Citizen, for fate plays some very cruel tricks on some of its best subjects, and this is certainly true of Thomas Wesley Benoist of Irondale, Missouri, who was born on December 29, 1874, one of twelve children. While he took part in the usual boyhood sports, Tom's chief interest was mathematics, history, and watching the eagles, cranes, and other large soaring birds of the beautiful Ozark hill country.

Finishing grade school, he took a night school course in business and read what he could find on mechanics and the meagre material then available on mechanical flight. One book that interested him was Chanutes "Progress in Flying Machines", published in 1894. Right after the turn of the century in 1900, Benoist met and became a close friend of A. L. Dyke, a pioneer in the automobile field, and author of many textbooks on autos and auto engines.

Tom meanwhile had met John Berry of St. Louis, who had an early inerest in engines, and airships. Benoist along with Berry was listed as "aeronautical exhibitors" at the Fair. The Benoist-Berry venture was another attempt to steer a spherical balloon and was not successful. Tom watched with great interest the flights of Roy Knabenshue in Captain Tom Baldwin's dirigible "California Arrow", and William Avery's flights in an 1896 type Chanute biplane glider which were the first heavier than air flights in St. Louis.

From all accounts, Benoist' first successful invention was an improved type of storage battery, that was said by some early motorists and airmen to have been "a darned good battery". He named it the "Black Jack" battery and produced it himself after he and his brother Charles opened an auto supply store in 1907. When Charles left, Tom, along with E. Percey Noel, opened the first supply house in America selling nothing but aero material and parts. This was called the "Aeronautical Supply Company", and abbreviated "AEROSCO".

Noel was a newspaper man, and an early aero enthusiast himself. In October, 1910, Noel began publishing America's first aero weekly called "Aero". When Noel started "Aero", he sold his interest in "AESOSCO" to Tom Benoist, who by 1910 was doing a thriving business indeed, and making full-sized kits for several aeroplanes of the period. These kits, along with a twenty foot biplane glider kit, included the 1909 Santos Dumont "Demoiselle" monoplane, 1909-Curtiss type, and Bleriot and Farman copies.

At "AEROSCO" Tom read and sold such early text books as "Vehicles of the Air", "Aeroplane Designing for Amateurs", and "Flying Machines". While he admired and respected Doctor S. P. Langley, he did not think very highly of Langley's textbook "Experiment's in Aerodynamics", but had a high regard for the publications of Gustave Eiffel's wind tunnel test in Paris.

In August 1910, grading began for Kinloch Field, near the site of the present Lambert Field. On September 18, 1910, with no previous flights, Tom Benoist made the first flight from the new field, when he flew his revamped Howard Gill biplane a distance of 450 yards. Gill was an early California airman, who sold his Curtiss type plane to Benoist at a bargain price. Thus Benoist became the first St. Louisian to buy an aeroplane and to manufacture them as well. He flew successfully, but unnoticed by the press at the big aviation meet at Kinloch in October 1910. While Tom practiced, such stars as Arch Hoxsey, "The Heavenly Twins" as Hoxsey and Ralph Johnstone were known, and many other early Wright pilots were making headlines daily. He watched Alfred LeBlanc of France set a speed record of sixty-five miles per hour in a trim little Bleriot monoplane. Just eight days before he soloed his rebuilt Gill, Captain Tom Baldwin won a three thousand dollar prize for a seven mile flight over the Mississippi River. Over 100,000 persons saw the "Red-Devil" plane of Baldwin's and while St. Louis was aeroplane crazy, they paid no attention to the eager but inexperienced Tom. But constant practice gave him the confidence and experience he needed and by the middle of October 1910, he was giving exhibitions in Amarillo, Texas. Here, one of flying's oddests accidents occurred.

While circling for a landing in his Gill biplane, two of the front elevator struts fell out. Landing the plane, he failed to cut the ignition switch, and was thrown forward of the machine. It passed over him, and the propeller gashed his right foot so badly that his big toe had to be amputated.

On November 17, 1910, an aeronautic show was opened to the public at the old Coliseum building in St. Louis. Everything from rubber driven models to balloons was on exhibit, including crude wing flappers and helicopters, which, when tested, stayed but a few inches off the ground. Here, Benoist sold the first airplane in St. Louis, which was a Bleriot monoplane copy, to Mr. George Kane of Alliance, Ohio. Tom's Gill-Curtiss type biplane with its glistening white fabric, varnished woodwork, and polished Boulevard engine which was made in St. Louis, got a lot of attention as it was the first St. Louis built aeroplane to make a successful flight. Near it, in contrast, was Captain Tom Baldwin's Red Devil biplane with even the propeller painted a flat red.

In January, 1911, Benoist opened a flying school at Kinloch, using improved and stronger built versions of his first plane. Starting with a few students the enrollment grew, and by July, Tom was a very busy man teaching his students theory of flight, aircraft and engine mechanics, practical flying, and at the same time managing his supply house. About this time, Anthony H. Jannus, who had been with Rexford Smith in Washington, D.C., joined Tom and became his chief pilot and instructor. A little later in 1911, P. G. (Bud) Morriss, a famous early pilot joined the Benoist group and became its first vice president and sales engineer.

From December 1910 to December 1911, the Benoist Co. made and sold over forty planes, all of which gave fine exhibitions and long service. Building up a good organization, Tom was able to devote more time to better designs and mechanical details. He insisted on a rigid check of every bit of material that went into his planes, and gave a lot of his personal time to this phase of the business. By the end of 1911, the Benoist Co. had become well known, and the famous emblem of the blue letters spelling "Benoist" with a red arrow through the name became a trade mark known by all early airmen. One of the company's highlights for 1911, was the laying of a heavy plank runway, one hundred yards long on muddy Kinloch Field to facilitate takeoffs. It was nicknamed "The Promenade". Extensive research has failed to disclose any airport runways prior to these crude wooden planks.

John Berry had a son named Albert, who like his dad, was a balloonist, and also a parachute jumper. In January 1912, the Berry's, along with Tony Jannus and Tom Benoist, worked out a new idea in aviation. They believed the parachute could be a life saving device in airplanes, and got busy on the idea. A test of a thirty foot chute was made at Kinloch on the ground and later drop tested from a Benoist school pusher with a hundred pound weigh by Jannus. Next a two hundred pound drop test was successful as well, and finally, the details of the parachute container and release device were worked out and later improved upon by Doctor F. M. Bell, and W. C. Lineback.

March 1, 1912, was cold but calm. The chute was packed in a sheet metal cone and held in place with a rubber band arrangement. The cone could be swung from a 45 degree angle to the line of flight to a vertical angle for the jump. A trapeze from the chute was fastened in place, and the jumper had to leave his seat, grasp the trapeze after climbing down to the skid and grasp a "snatch block", then leap into space. Taking off at 2:30 P.M., Jannus and Berry covered the 18 miles between Kinloch Field and Jefferson Barracks in twenty minutes. From a height of 1500 feet, Berry leaped and so made the world's first parachute jump from an airplane, landing unhurt behind the mess hall. Jannus landed on the parade grounds, and along with Benoist who had driven to the grounds received the congratulations of Col. W. T. Wood, Commandant of the historic Army Post, and the cheers of his officers and enlisted men.

In March 1912, Benoist, Bell, and Jannus designed a tractor biplane for Bell's pair of parachute jumpers, Wilford and Luther Lineback who planned a series of exhibitions in America and Europe. This tractor had a simple box-like fuselage of very slim lines and had the pilot and jumpers seats on top of the fuselage, with the jumper in front, just behind the 60 H.P. Roberts engine. Over the wing tip ailerons, its span was a little over forty feet. Completed in April 1912, it proved to be a fine craft, but a little underpowered. On May 26, 1912 the noisy but usually reliable two cycle Roberts engine cut out while Dr. Bell and Wilford Lineback were climbing. Bell tried a turn and the ensuing crash from about 800 feet, he and Lineback were badly hurt.

Meanwhile, Tom Benoist designed and built a new tractor along the lines of his own ideas called the "Type 12 Cross Country". It had a span of forty five feet over the ailerons, and was twenty feet, six inches in length. It had no stabilizer or vertical fin and its ailerons were fixed at the outer wing struts and were flexible, like the tail group. This flexibility was gained from ribs of combined steel and oak strips which presented a positive or negative camber as required. The ailerons were controlled by a bell crank and two wires leading to the aileron lever in the pilots cockpit, while the tail wires were inside the fuselage until they emerged from the narrow rear edge of the fuselage, only fifteen inches wide. The pilot had two control sticks. The one on his left, controlling the elevator and ailerons, and the right side controlling the rudder. A fifteen gallon gasoline tank under two pounds of air pressure was located under the passenger's seat. Both sixty

(continued on page 8)

Left to right: Albert Berry, Tony Jannus, Tom Benoist in front of Benoist' 1911 pusher. Particularly interesting is use of spring leaf type axle arrangement.

"THE MAGELLANS OF THE AIR"

The Thirtieth Anniversary of The First Global Flight

By
R. L. Bliss

Illustration By Ronald McCarty

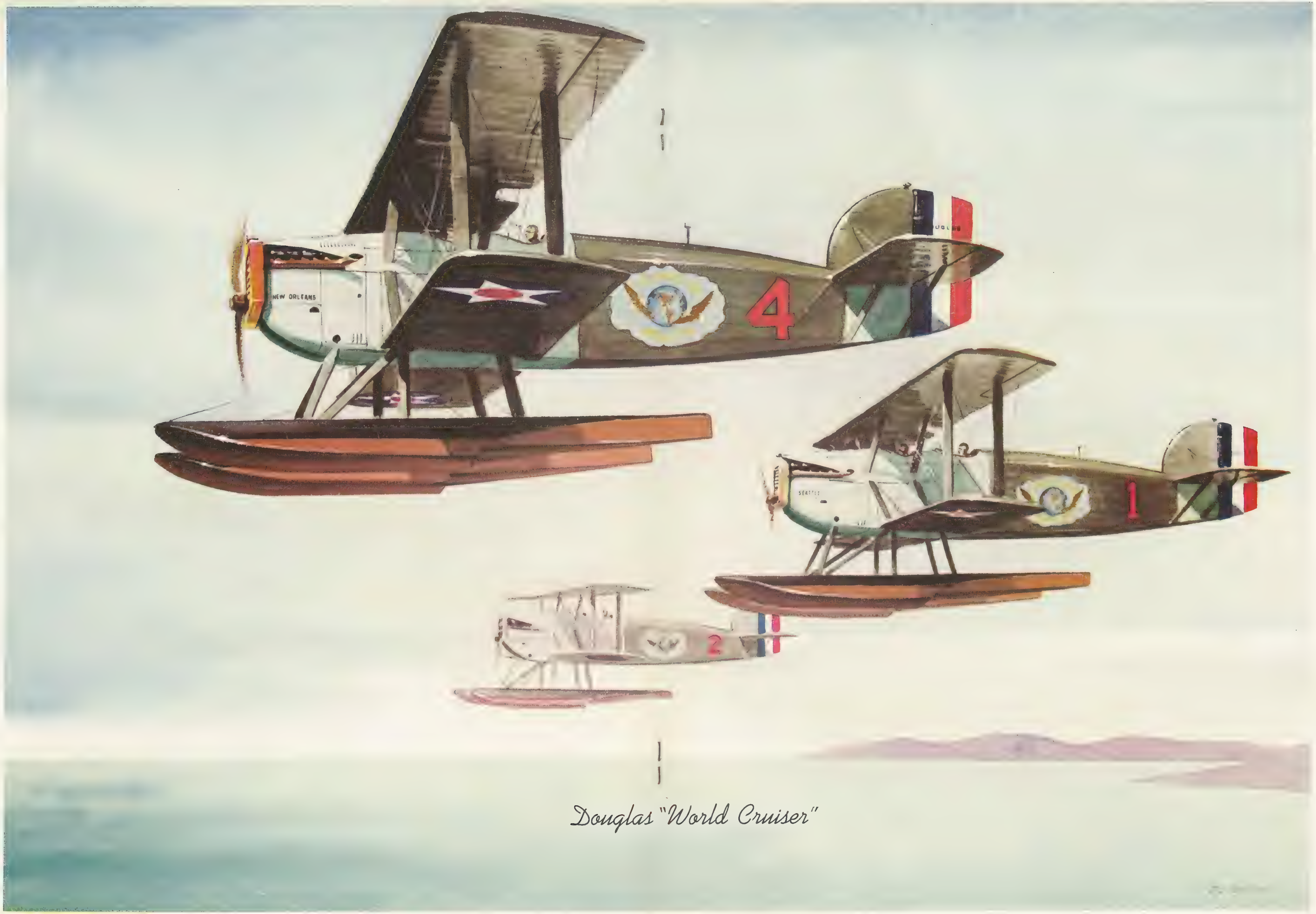
L to R Major Martin, Lieutenants Smith, Wade, Harding and Nelson, and Sergeants Harvey, Turner and Ogden.

September 28th of this year marked the thirtieth anniversary of the completion of the first successful world flight. The year 1924 was famous for its world flight projects sponsored by various nations. England, France, Italy, Spain, and Portugal all had entrants, but it was the United States Army Air Service World Flight Squadron that achieved success.

The USAF's present position as a global striking power is due in part to this pioneering effort begun three decades ago. At the time, the operation was so daring and so difficult that it taxed the scientific and technical skills of the Army's aviation organization, and attracted the attention of the world for months. It required specially designed airplanes, carefully selected crews, and a world-wide network of advance bases.

The flight was made under the direction of the late Maj. Gen. Mason M. Patrick, then Chief of Air Corps. The Douglas Company was commissioned to build an experimental cruiser to Army Air Service Specifications. The resulting configuration was a wood and fabric biplane of 50 foot span, and measured 36 feet from propeller to rudder. Power was supplied by a Liberty 12-cylinder water-cooled engine developing approximately 450 HP. With the airplane fully loaded, the all-up weight was a little over 8000 pounds including 465 gallons of gas, 30 gallons of oil, and 5 gallons of water.

The prototype was flown to McCook Field, Dayton Ohio, for preliminary tests and later to Langley Field, Hampton, Virginia, for acceptance trials. At this point, a group of hand-picked pilots were selected, consisting of Major Fredrick L. Martin (commanding) and Lieutenants Lowell H. Smith, Leigh Wade, and Erik H. Nelson. Lieutenants Leslie P. Arnold and LeClaire Schultze were chosen as alternates. At Langley Field, the cruiser crews



Douglas "World Cruiser"

were put through an intensive 6-week training course.

The material logistics and advance planning for the flight were unparalleled in the Air Service up to that time. Under the able direction of Lieutenant St Clair Streett, four advance divisions were organized and dispatched to advanced bases along the global route. At McCook Field, special crates of spare engines, parts, and tools were readied for shipment to advance bases.

On March 17th, three of the cruisers left Santa Monica California's Clover Field, for Seattle on the first leg of their global flight. The fourth cruiser, flown by Erik Nelson, had been delayed by an engine change and joined the rest of the group a day later in Seattle.

In Seattle the cruisers were christened in honor of four American cities as follows:

Cruiser Seattle, Maj. Martin and Sgt. Harvey

Cruiser Boston, Lt. Leigh Wade and Lt. Henry Ogden

Cruiser New Orleans, Lt. Erik Nelson and Lt. Jack Harding

Cruiser Chicago, Lt. Lowell Smith, Sgt. Turner

On April 6th, four heavily laden cruisers left the mists of Seattle's Lake Washington for Alaska and the Aleutians. Hazardous flying weather dogged the first leg and the Seattle, with Maj. Martin and Sgt. Harvey, crashed in the wilds of the Alaskan peninsula near Chignik. Several days later, the world was relieved to learn that the two had survived the crash and had struggled back to civilization, but the loss of their airplane prevented them from rejoining the squadron.

The three remaining cruisers continued westward under the leadership of Lowell Smith, flying above the Alaskan Peninsula and the Aleutian Islands and making the first crossing of the Pacific by air. Their hops were from 200 to 600 miles each, between service ships or bases which had been prepared in advance. From Japan they flew down the coast of Asia and across the Indian Ocean. After the Indian Ocean crossing, conventional landing gear was substituted for the pontoons, and the flight continued across India's hazardous Sind Desert to Arabia and the Bosporous.

The flight was continued across Europe and on to London, England, which was reached on July 16. At Brough they were conditioned for the Atlantic flight, including a change from wheeled landing gear to pontoons. In the hop between the Orkney Islands and Iceland, the Boston, with Lts. Wade and Ogden, was forced down by engine trouble and was damaged as attempts were being made to put it aboard. The New Orleans, carrying Lts. Erik Nelson and Jack Harding, was the only one to reach Iceland on the first try. However, the Chicago followed soon after, and these two remaining planes continued to Greenland, the longest hop of the entire flight, 830 miles then on to Pictou, Nova Scotia, where a replacement plane for the Boston had been sent.

The flight through the United States was a triumphal tour, culminating with the arrival at Seattle on September 28, thus completing a world circuit of over 28,000 miles (more than the equatorial circumference) in 371 hours, 11 minutes flying time and an elapsed time of 175 days.

A scale model of a world cruiser biplane was presented to the W. F. Durand Museum at the 1954 summer meeting banquet by Donald Douglas. A souvenir brochure commemorating thirty years of global flight was also prepared for the banquet by members of the Historical Branch, Los Angeles Section. The enclosed color reproduction is furnished through the courtesy of the Douglas Aircraft Company.

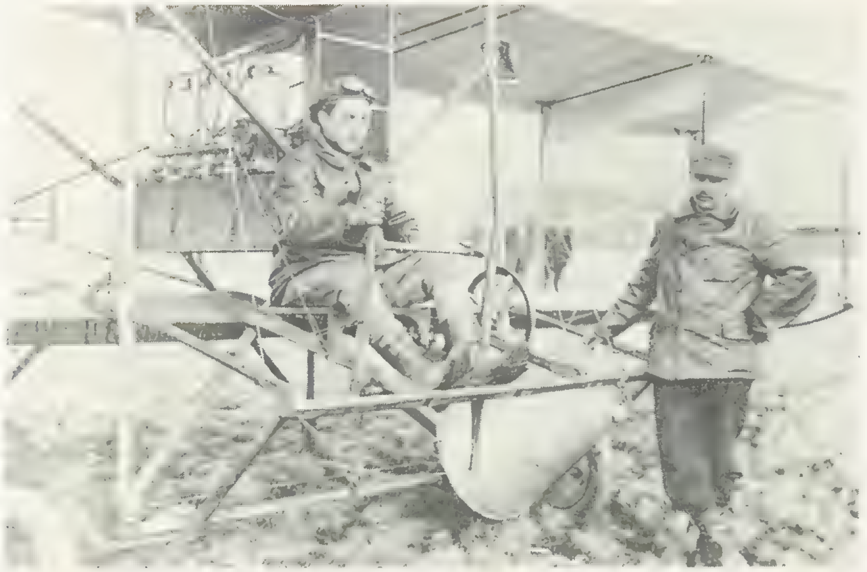
SUMMARY OF PRINCIPAL WORLD FLIGHTS

Date	*Crew*	*Distance*	*Time*	*Type*	*Engine*
4-6-24 9-28-24	Major Martin, Lts. Smith, Wade, Ogden, Nelson	28,945 (approx)	5 mos 22 days	Douglas Biplane	Liberty 12 400 hp
6-29-28 7-22-28	Collier - Mears	19,725	23 days 15 hrs 21 mins	Fairchild Monoplane "City of New York"	P & W Wasp 400 hp
6-21-31 7-1-31	Post - Gatty	15,128	8 days 15 hrs 51 mins	Lockheed-Vega "Winnie Mae"	P & W Wasp 400 hp
7-15-33 7-22-33	Post	15,596	7 days 18 hrs 49½ mins	Lockheed-Vega "Winnie Mae"	P & W Wasp 400 hp
7-10-38 7-14-38	Hughes	14,791	3 days 19 hrs 8 mins 10 secs	Lockheed Model 14	Wright R-1820 1200 hp
4-15-47 4-19-47	Reynolds - Odom	19,899	78 hrs 55 mins 56 secs	Douglas A-26A "Reynolds Bombshell"	P & W R-2800 1850 hp
8-10-47 8-14-47	Odom	19,000 (approx)	73 hrs 5 mins 11 secs	Douglas A-26A	P & W R-2800 1850 hp
2-26-49 3-2-49	Capt. Gallagher and Crew	23,452	94 hrs 1 min	Boeing B-50A "Lucky Lady II"	P & W R-4360 3000 hp

(continued from page 5)

and seventy five horse power Roberts two cycle water cooled engines were used. The two landing wheels equipped with four by twenty inch clincher tires were mounted on flat leaf steel springs as was used on the school pushers, while a flat spring was used on the rear of each landing skid, keeping the plane in flying position on the ground. Its take off, flying and landing characteristics were excellent as it was an inherently stable machine. Only the head and chest of its occupants were exposed to the wind, as the fuselage was fabric covered from nose to tail. The double surfaced wings had a slightly upturned section from the rear spar to the trailing edge. They were braced with piano wire spanwise internally, and with thin diagonal metal strips inside the thin airfoil from the corners of the five foot sections.

Charles Day had a tractor with a front elevator and no fuselage in 1910, and a later uncovered fuselage model flown at Kinloch after the advent of the Benoist "Cross Country" model. So it seems only fair to accept the Benoist claim of "The First Successful Tractor Biplane in America".



Tony Jannus in seat, Albert Berry alongside. From this plane, Berry made world's first airplane parachute jump, March 1, 1912.

While tests were being made of the new tractor, another important event took place at Kinloch Field. Captain Frank R. Lang, of the Army Recruiting Service while stationed in St. Louis, invented a light rapid fire gun of .32 calibre, to be used in aeroplanes. His friend, Col. John J. Dooley, of the Army Ordnance Corps, had the gun made by the Savage Arms Co., early in 1912, and Capt. Lang contacted Benoist in regards to testing it from the air. A Benoist school pusher was used. The gun was a pistol type with a short rifle like barrel, extra long clip, and a sort of skeleton like steel wire shoulder piece. Col. Dooley and Capt. Lang were both pilots and they teamed up with Tony Jannus to make the test. On June 4, 1912, four foot square sheets of muslin were laid out on Kinloch Field, and Dooley, Lang, and Jannus took turns firing at them from altitudes of fifty to five hundred feet. These tests were all successful, but got very little press space. The first test on June 4, was three days ahead of the first regular machine gun test made by Charles DeForest Chandler at College Park, Maryland on June 7, 1912. The Lang, Dooley, Jannus tests were the first tests of a rapid fire gun designed for aircraft use.

With Tony Jannus as pilot, the tractor was the sensation of the big Chicago Air Meet, of 1912. In four days of flying with wheels and floats, it needed no repairs whatever. It set an American endurance record for one minute thirty seconds by carrying three passengers besides its pilot, Jannus. It won twenty kilometer speed contest over Martin and Curtiss types, six first prizes when equipped with a single float under the fuselage and two wing tip floats, and six third prizes. Jannus, with only one plane for all events as against two or more planes per each of the other contestants was third highest money winner of the meet. As some of the world's outstanding airmen took part in this meet, Benoist was well pleased indeed.

Tom believed the ideal passenger plane for long flights was not a pontoon job, but a flying boat. Accordingly, he was right along with Curtiss in this respect. In November 1912, Hugh Robinson, by this time a well known Curtiss pilot, joined forces with Benoist and assisted in completing the first Benoist airboat which was flown in December, 1912 from the Mississippi River at St. Louis, with Robinson flying it. This was the second plane of this kind built in America. Benoist flew it, and was not pleased with it.

After some difference of opinion, Robinson left the company and Benoist redesigned the plane himself.

The re-vamped model gave excellent results. This airboat had typical Benoist wings of 42 feet, 2 inch span and was 26 feet, 10 inches long. Its Roberts 75 H.P. engine was down in the hull of the craft and through a tubed roller chain drove an 8 foot, 6 inch propeller in the rear. Although Benoist had experimented with trailing edge ailerons, the school plane type ailerons were used on this model. It was planned to equip this model with wheels for land operation that could be raised or lowered by a hand lever, but somehow, this amphibian idea was never developed. Many improvements followed in the tractor and airboat designs and the inherent stability of the new machine was a notable feature.

In August of 1913, a refined new airboat was flown at Creve Couer Lake. This ship proved to be the basic design for the plane used on the World's first scheduled airline. Larger than its predecessors, its hull was forty inches wide against twenty two inches for the late 1912 model. Trailing edge ailerons were used, and a triangular stabilizer to which new elevators were hinged was employed.

Tony Jannus before the start of flight from Omaha to New Orleans November 7, 1912. Benoist type 12 tractor.

BENOIST
THE FINAL INSTRUCTIONS AT THE START
OMAHA NEBR. TO NEW ORLEANS

During this period the Benoist school had some very interesting students. Among them being Walter Lees, who later worked with Bill Stout in developing and testing the Ford all metal planes; Eddie Korn, and Bill Bleakley. Korn, now a Doctor, is restoring his Blenoist tractor for the Smithsonian, and this is possibly the only Benoist plane in existence today.

A Florida business man named P. E. Fansler wrote Benoist regarding the feasibility of an airline between St. Petersburg and Tampa, Florida. Benoist like the idea and in his reply stated that the new Benoist "Safety first" airboat would be the craft to use. On December 17, 1913, just ten years since the Wrights flew at Kitty Hawk, Tom Benoist arrived in St. Peterburg and signed the airline contract. He spoke these words: "We are going to do something here this winter which never has been done before, and which will attract attention from all the world—". Roger Jannus, Tony's younger brother, had graduated as an excellent pilot and mechanic at Kinloch Field, and became a part of the airline crew.

On Dec. 31, 1913, a Benoist "Safety First" airboat was set up and test hopped by Tony Jannus with a James Foley as passenger. Then on January 1, 1914, the first trip of a regular scheduled airline was made. First flight tickets were auctioned off, and the proceeds given to the Benoist Co. Ex-mayor of St. Petersburg, A. C. Pheill, became the world's first scheduled airline passenger when he bid $400 for the first flight. Mr. Noel E. Mitchell was second, with a $175 bid. Pheill got his seat, Tony called to Jay Dee Smith (Smitty) to "crank her up", and they were off to the wonderment of thousands who crowded the waters edge for the event. Tampa is 21 miles across the Bay, and on the first flight, a brisk wind was faced, with the flight taking 23 minutes. The return flight was made in 20 minutes.

The line which was subsidized by Florida business men made two flights daily, six days a week. The regular fare was $5 per person and $5 per one hundred pounds of freight or express carried. Shortly after the opening of the line, a new Benoist airboat was added which had an improved front on the hull that protected its occupants from water spray during take offs and landings. The line was then extended and flights made to Manatee, Bradenton and Sarasota. It operated successfully for four months and even made a night flight between St. Petersburg and Tampa, carrying a Miss Marian Ames as passenger. George Ade, the famous humorist was among many notables who used the line. A total of 1205 passengers were carried without injury, and while the line did not make any money, the airline idea of Benoist' was proven sound.

Tom saw the importance of developing large ships for passenger carrying and centered his attention on the twin engined project. Meanwhile, Curtiss with the help of Rodman Wanamaker, was making headway with the Trans-Atlantic plane "America". As is known, the European War halted the proposed flight.

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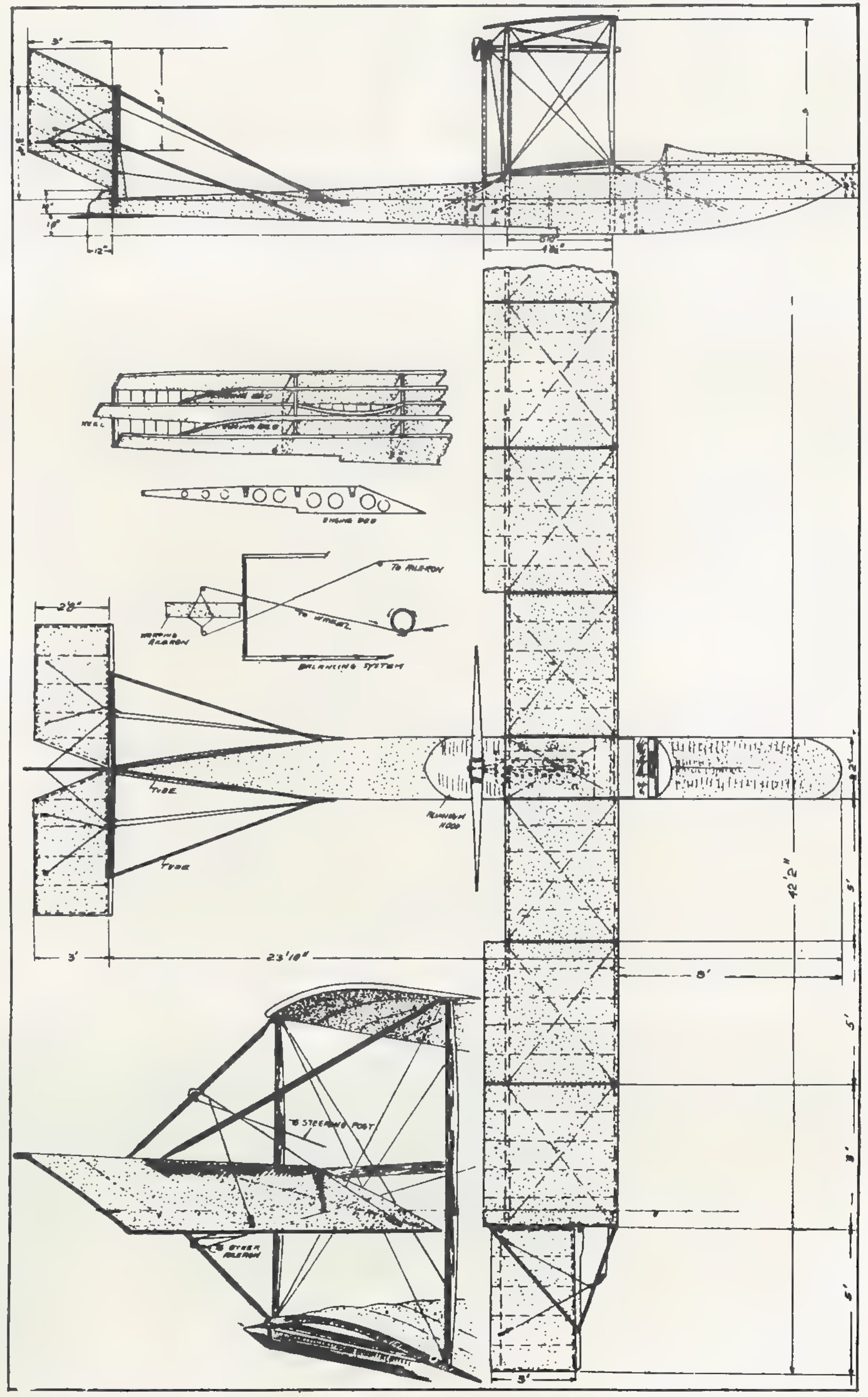

BENOIST FLYING BOAT

Two 100 H.P. Roberts two cycle engines were installed in the big Benoist which made its first test flights late in 1914, and early in 1915. It was called the model G-17 seven passenger airboat. It had a span of 75 feet, but was only 30 feet long. It was improved through 1915, and early 1916, and was a fine performer for its day.

Due to what must be briefly described as monetary differences, Tony and Roger Jannus left the company and formed their own. In demonstrating a Curtiss plane to Russia in 1916, Tony was lost in a flight over the Black Sea. Details of his death still remain a mystery. Roger Jannus joined the aviation section of the Army Signal Corps. as it was then known, and became an instructor in aerial combat tactics. He and a student died in a crash of a training plane in Sept. 1918.

Among the new Benoist models were new airboat designs embodying advanced construction ideas and new land machines as well. Especially noteworthy were the new model H-17 and J-17 cross country planes. These biplanes resembled the Curtiss Oriole of the early 1920's. Each had an all steel monocoque fuselage. The H-17 with a 100 H.P. Roberts engine was a two place ship, while the J-17 with a 165 H.P. Roberts was designed for one pilot and four passengers. It carried enough fuel for four hours of flying. Although underpowered, it was one of the cleanest looking aircraft then in existence.

By now, with Europe in its second year of war, things were in a sorry mess in our own infant aviation industry. Benoist struggled valiantly trying to keep going until orders he was sure of, would materialize. Tom sought orders from the U.S. Army and Navy to no avail. Contrary to one report, I have a letter from the Navy Dept. to the effect that no Benoist planes were purchased by that body. The Roberts engine was developed from a marine type, and Tom knew for a long time that a lot of important "high brass" frowned on this two cycle water cooled engine. Still, he felt obligated to go along with Roberts hoping things would straighten themselves out. One customer who bought one of the 1913 airboats installed a Sturtevant engine and nearly doubled the performance of the plane. Tom wanted to re-organize his business and use whatever engines he thought best for the aircraft in question.

Tom was on the eve of a great expansion when a terrible thing happened. Having no car for a time, he and some associates used the Sandusky street railways for transportation to his factory. On June 14, 1917, Tom boarded a street car and as the car neared the factory, it made a fast turn around a street corner where close by, stood a telegraph pole. Tom's body swayed outward from the open type "summer car", and his head struck the pole. Poor Tom never regained consciousness, and died three hours later.

With his death, everything fell apart and unfortunately, orders were not filled, records, photos, drawings and other valuable material vanished. This left it very difficult indeed to accurately compile the final history of this grand character, affectionately known as "Tom".

Tom was a man of great foresight and knew that more powerful engines and better material in general would be available after the end of the war in Europe. By 1917, he had outlines sketches and a few drawings of an airboat designed to carry fifty passengers and a crew of two. It would be a cantilever wing monoplane with four engines inside the wing where they could be repaired if need be, in flight. It would be made of an aluminum alloy stronger than the existing 1917 types. He estimated the power of the engines would have to be 900 to 1,000 H.P. each. But some of his friends insist that with all his advanced ideas, he lacked two important aids. First, political influence, and second, lack of time and money to develop them. His was a crowded life, devoted to the advancement of the aeronautical sciences, rather than personal glory.

On December 4, 1953, St. Petersburg, Florida honored the fiftieth anniversary of powered flight, and the organization of the first scheduled airline together. Many notables, Early Birds, and friends of Benoist attended. At the luncheon in the Soreno Hotel, Col. Eddie Rickenbacker and Representative Carl Hinshaw praised the work of the Benoist Company. Hinshaw stated that in his opinion the 1914 Airline was the first practical use of the airplane and second in importance to the first flights of the Wrights. Col. Rickenbacker presented a flag to the City of St. Petersburg which was raised over a monument marking the take off site.

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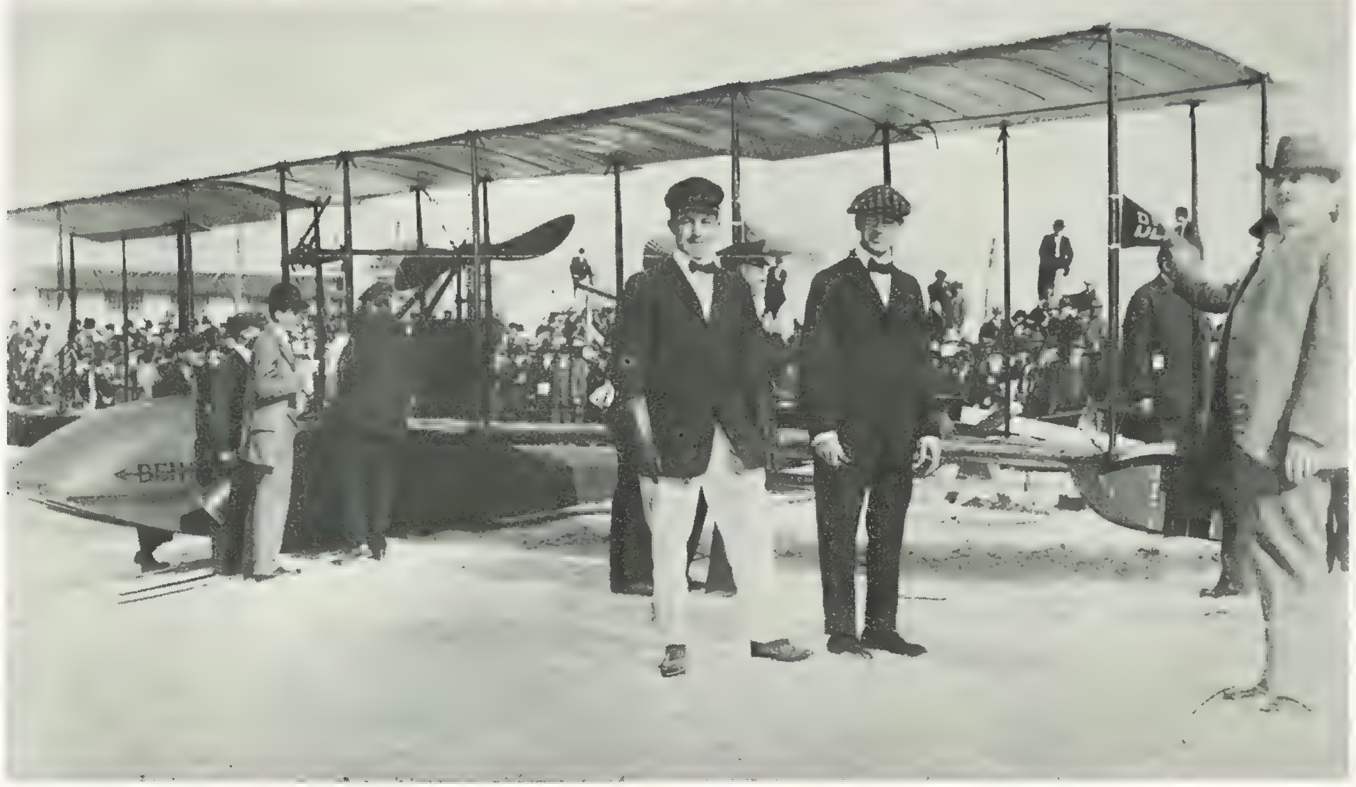
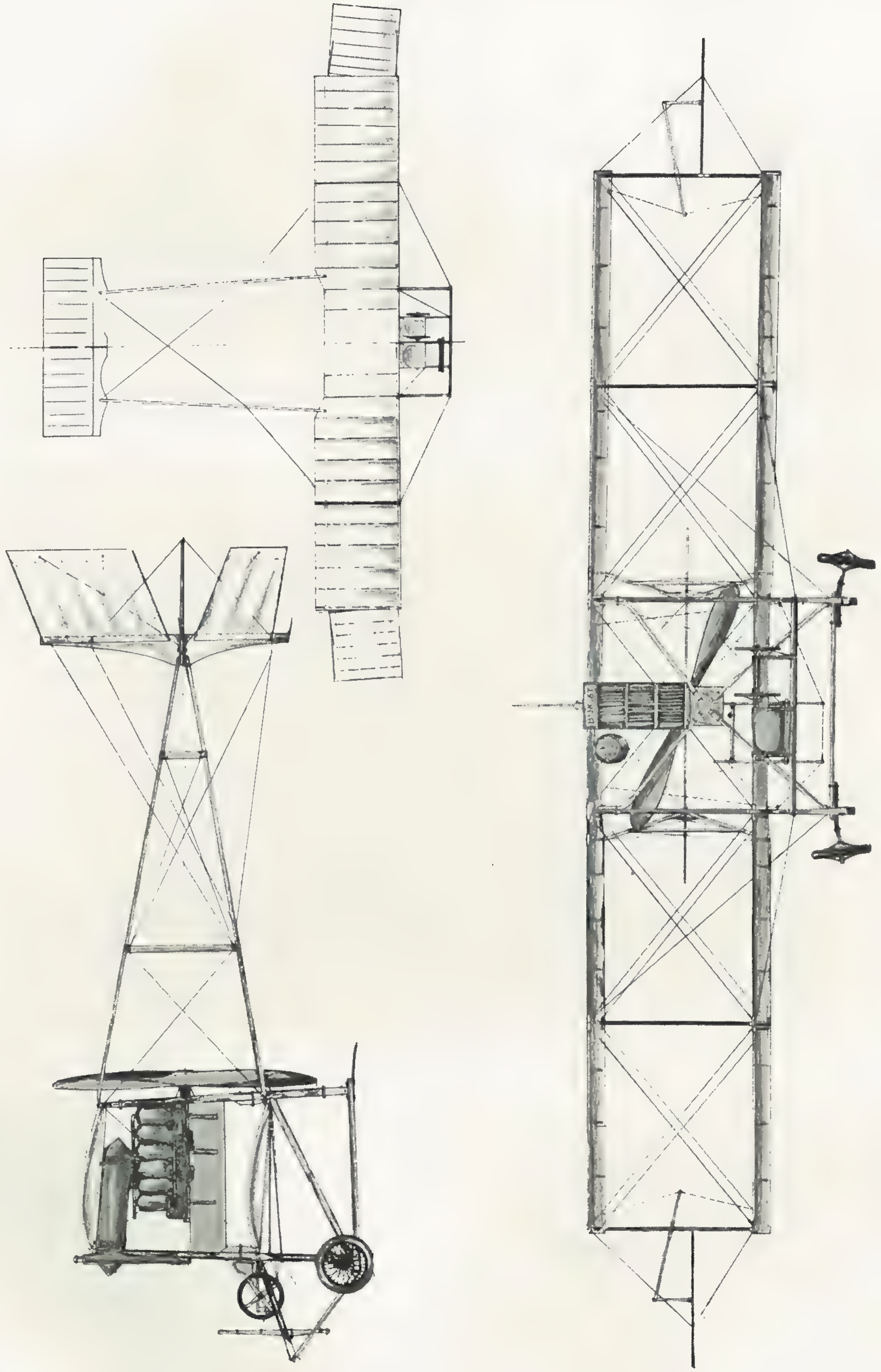


Jannus and A. C. Pheil in checkered cap, prior to take off during operations at St. Petersburg, Florida.



1912 BENOIST SCHOOL TYPE BIPLANE

(continued from page 3)

forced landings in that period could be attributed to failures of the water cooling system.

The radial engine produced more horsepower per pound of system weight than the in-line type, for the latter required bulky radiators and extensive plumbing. However, the Air Corps did not feel that the Wright and Pratt & Whitney radial engines of this period were sufficiently developed to replace the Curtiss D-12, which gave the Curtiss fighters in which they were installed greater speed than similar designs incorporating radial engines.

To evaluate the radial air-cooled engine, the Army converted a P-1A into an XP-3 by installing a Curtiss R-1454 engine of 400 h.p. The weight differential between the P-1A and XP-3 was relatively minor, since the R-1454 was a newly developed engine and much too heavy. In addition, the XP-3 was 10 miles an hour slower than the 161 m.p.h. attained by the P-1A. The Air Corps was not satisfied with the Curtiss R-1454 engine, and replaced it with a Pratt & Whitney R-1340 of 500 h.p. redesignating the airplane XP3-A. This airplane, 177 pounds lighter and a few miles faster than the P-1A, was submitted to an extensive period of development. The XP-3A was modified with a full cowling and circular fairing extending back to the pilot's cockpit, and an experimental cowl flap system for engine temperature control, installed forward of the engine between the cowl and the propeller gear housing.

The P-3A, five of which were procured in 1928 by converting AT-5As, incorporated a P & W engine (R-1340-3) of 450 h.p. Of customary Curtiss construction, the 22'1" fuselage consisted of steel tubing, fabric covered, with the exception of the fuselage top deck and the cowling aft of the engine, which extended to a point just forward of the lower wing. These sections were dural, as were the landing gear and wing strut fairings. Wing construction was conventional two spar, wood type of 31'6" span. Steel tubes were utilized for the main empennage structure, supplemented by dural ribs and secondary spars. The stabilizer was adjustable during flight. Fabric covered all wing and tail surfaces.

On an official test flight of the P-3A at Wright Field on January 31, 1929, the pilot reported that this model had a shorter take-off run than either the P-1 or Boeing PW-9, and that it also had a shorter radius of turn. However, there was slightly more vibration encountered than in aircraft powered by a Curtiss D-12 in-line engine, and the P-3A vibrated excessively at full throttle when diving. Other flight characteristics of this aircraft were . . . "excellent controllability at all speeds" and a tendency to come out of a slip but not out of the resultant spiral dive.

The test pilot also reported that the P-3A flew well in inverted flight, although the carburetor would load up. The radial engine did not pick up in a dive as quickly as quickly as a D-12 in-line engine, and lost power in steep climbs or stalls much quicker than the D-12. The P-3A landed slowly, and handled well on the ground. General visibility was better than in the Curtiss P-1 or Boeing PW-9.

Despite the many superior qualities of the P-3A, the Army Air Corps reverted to in-line engines on subsequent Curtiss Hawks, and until the appearance of the Boeing P-12 in 1929, the radial, air-cooled engine was dormant for fighter aircraft.

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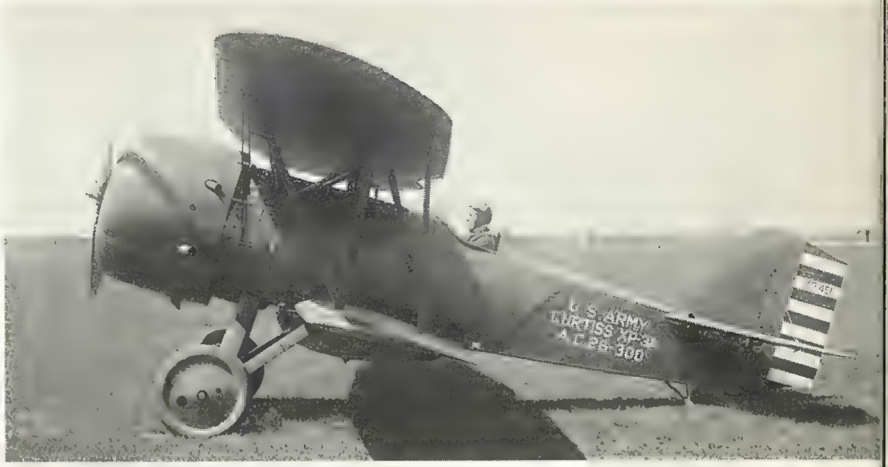
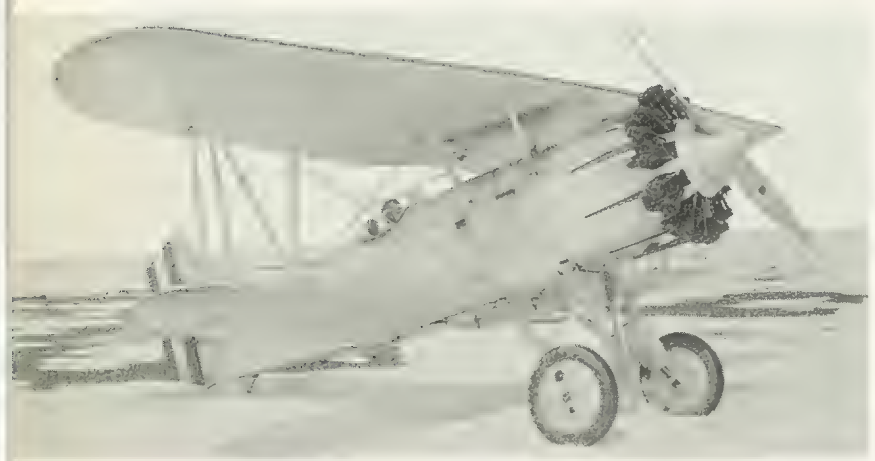


P-3 series "Hawks" had radial engine. Modified XP-3A shown here.

Slick F6C-4 was Navy version of Air Corps P-3A "Hawk."



The Navy, was already sold on radial engines for fighter aircraft, but desired documented evidence to confirm its opinions. Consequently in 1930 it requested the NACA to conduct a series of competitive tests on a Curtiss F6C-3 and F6C-4. The F6C-3 (Army P-1B) was powered by a Curtiss D-12 engine of approximately 425 h.p., the F6C-4 (Army P-3A) by a Pratt & Whitney R-1300 radial engine of approximately 425 h.p. The radial powered aircraft was 350 lbs. lighter than its in-line counterpart, but in all other respects the two airplanes were identical.

The F6C-3 was a faster diving airplane, due to its greater weight. In level flight, and at 100 m.p.h., the F6C-3 would lose 405 feet in four seconds from time of abrupt movement of the control stick forward. In a comparable period, the F6C-4 lost 290 feet. On pull-outs, at comparable speeds of 140 m.p.h., the in-line powered fighter would lose 310 feet, the radial, 175 feet.

Loops favored the F6C-4, being completed in 10% less time than for the F6C-3. Likewise, the minimum radius of horizontal turn for the radial engine airplane was superior, 135 feet at 61.5 m.p.h. to 155 feet at 76 m.p.h. for the F6C-3.

Additional performance figures for the F6C-4 (from Navy Performance Data SH-3B) were—climb to 10,000 feet in 6.1 minutes, at which altitude 156 m.p.h. was attained, and service ceiling of 23, 170 feet was claimed, with an absolute ceiling of 24,300 feet. The P & W engine in this test was credited with 435 h.p. at 1950 r.p.m. Split type landing gear was installed on this particular model, which was aerodynamically superior to the cross axle type incorporated for deck arrester gear on the production version.

There was really no victor in the battle of engine types, and both in-line and radial engines were used extensively in fighter aircraft until the advent of jet engines.

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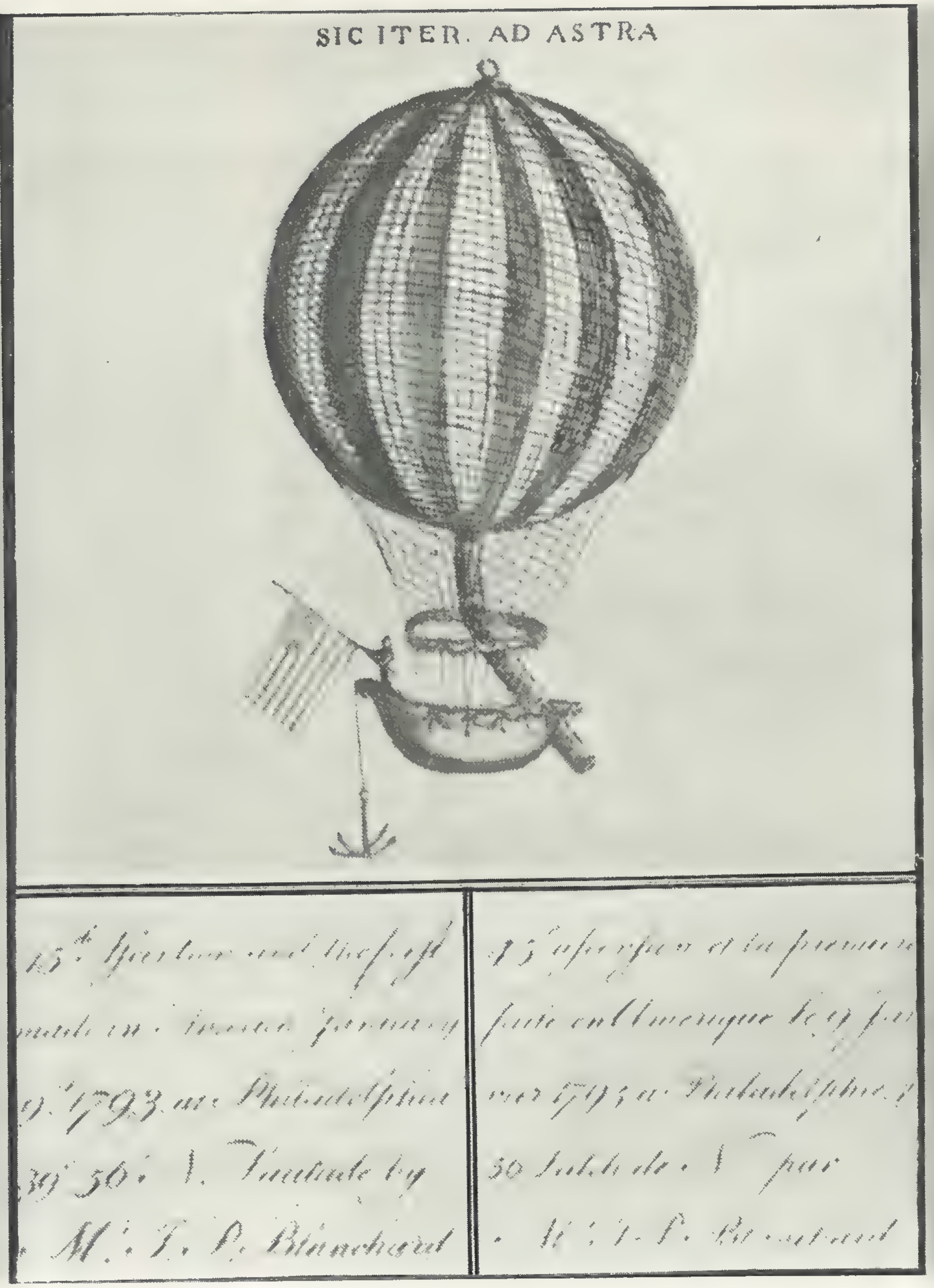

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CONTENTS

Volume 6 **Number 4**

FEATURES

The Hawk Series (Part Three) by Thomas Walker 3
Washington and the Inception of Aeronautics in America by Sidney I. Pomerantz 4
Curtiss F6C-4 Three-view by Dustin Carter 7

DEPARTMENTS

Courtney's Corner 2

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COURTNEY'S CORNER

EARLY TEST FLYING

By
Frank T. Courtney

From the Sunday Supplements you will note that the test pilot is a dashing, reckless birdman, willing to try anything once, calmly careless of unknown dangers lurking in an untried plane, contemptuously fearless of broken wing or blazing engine. Such "test pilots" have cropped up now and then and some became quite famous while they lasted; but usually they were too interested in challenging rather than studying the foibles of a new airplane, and too often they produced a cloud of expensive debris instead of a constructive report.

The prototypes and models of all test pilots were the first pilots, Wilbur and Orville Wright. Anything but spectacular, they were meticulously careful in their preparations and their observations, studiously avoiding all risks that were avoidable, happily but carefully taking all risks that had to be taken. It is noteworthy that similar comments can be applied to almost all of those pioneers who designed, flew and improved their own airplanes, Curtiss, Bleriot Farman, Roe and others. It is part of the historical pattern that these early test pilots were all fair to good mechanics, but had little or no academic technical background. Langley, the professor, had not the make-up of a test pilot and his famous airplane was a famous failure, largely as I still believe, because he failed to design into it those practical features that an intending pilot would not have omitted.

From the Wrights onward, the test pilot has been widely classed amongst Nature's screwballs. After all, it was dangerous enough to fly in a tried and tested airplane, so who but a nut would want to take up a new contraption which would most probably do something either lethal or vicious? Obviously the guy didn't have enough sense or imagination to know when or how to get scared.

Actually the test pilot's famed "fearlessness" is entirely mythical; usually he scares faster than most people but knows how to use fear as Nature's great stimulant in face of danger. Odd to that, fast mental and nervous reactions, an inborn sense of observation and analysis, a wide-open mind combined with an insatiable curiosity which submerges the unpleasant effects of fear, and you have the physical make-up of a good test pilot. He bears about the same relation to the chair-borne engineer and the laboratory scientist that Lewis and Clark bear to Rand and McNally.

The first flight of a prototype aircraft is still a thrill. As of old, the pilot is usually too busy to share the tense excitement of the spectators.

Basic principles of test flying remain what they always were, but processes have changed. At one time, you didn't even know whether you could get off the ground at all, or if you did, whether you could clear the trees at the end of the field, or if you did that, whether the controls could keep you right way up (stability was then just a dictionary word) or if they could, whether the engine would run long enough to get you round and down. You tried all you could either on or a few feet off the ground, and then waited, sometimes days, for perfectly steady air before launching into the blue. Lack of parachutes had its advantages; you often learned a whole lot whilst riding a crippled plane down to the ground just because you had nothing to bail out with.

Today, problems of that sort have largely vanished, but always new problems come up to replace the old. As with many other processes in modern aviation, the work of flight testing is being largely transferred from the man to the machine, and there is a regrettable tendency to regard the test pilot as merely a chauffeur to a bunch of oscillographs, recording devices and electronic black boxes. Whilst this gadgetry is necessary today to gather data which no pilot could possibly supply, there remains a wide field of flight problems where cold figures and graphs can and do badly fool the design-office engineer, and where the art of the real test pilot should be given more scope than ever.

Armstrong-Whitworth "Siskin II" in which the author did much early test flying.

THE HAWK SERIES

Part Three

By
Thomas Walker

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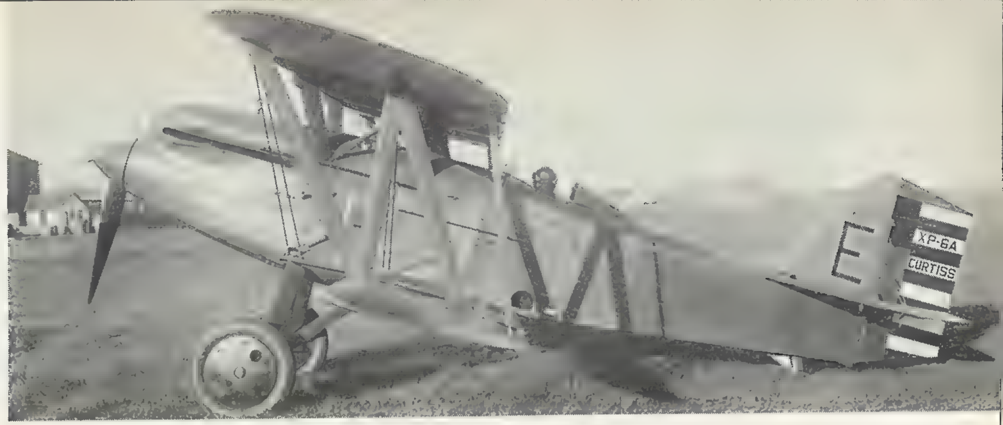


Lt. L. C. Batten won 1927 Free-for-all Military Pursuit Race in Curtiss XP-6A.

U. S. military aviation in 1927 fared rather well by the standard of those days, considering there were no immediate threats to world peace. The five year program inaugurated in 1926, provided for increases in equipment and personnel for the Air Corps, and $21,891,000 was available on July 1, 1927 for continuation of this plan. Of this amount, $12,000,000 was authorized for procurement of 590 aircraft of various types. Air Corps personnel was to be increased to 1100 flying officers and 10,008 enlisted men, plus 110 reserve officers placed on active duty for one year. Equipment on hand included 173 pursuit, 403 observation, 78 bombardment, 159 training, 27 cargo, 27 photographic, and 1 attack aircraft. True, this was a pitifully small force by today's standards, and only $2,200,000 was available for research and development; however, considering that in 1939 (with world tension at the breaking point) only 390 military aircraft were procured by the Air Corps and only 219 planned for 1940, 1927 wasn't a bad year at all for the Army's flying service.

The National Air Races of 1927 were held in September at Spokane, Washington, and probably the most exciting event was the Free-for-all Military Pursuit Ship Race. The Navy entered three Boeing FB-5's and a Curtiss F6C-4; the Air Corps three Curtiss P1-B's, a Boeing PW-9C, and two new type of aircraft, a Curtiss XP-6 and XP-6A.

The latter two were powered by a new Curtiss engine, the V-1550, predecessor of the V-1570 Conqueror. The 700 h.p. output of this new engine equaled that of the Packard 2A-1500, used in the Navy FB-5's.

When the 120 mile race was completed, the XP-6A had won by a large margin, averaging 201.2 mph, while the second place XP-6 averaged 189.6 mph. In third place was an FB-5 with a speed of 176.9 mph. Although specially built racers had surpassed this speed in the Pulitzer Trophy Races of 1922 through 1925, this was the first time an aircraft designed as a military pursuit had broken the 200 mph figure.

The XP-6A, ostensibly a combat aircraft, incorporated some design features that had proved unsuitable for field service. The fuselage came from a Curtiss P-1A, modified to take the longer but narrower engine. The wings were of the PW-8 design which incorporated wing radiators for the engine coolant. The wing radiators, although providing less resistance to the air flow and a corresponding increase in speed, leaked a great deal and had a poor maintenance record in the PW-8. Consequently, the XP-6A could not be considered seriously for production, and in fact was built as a race project. It did provide data for the engineering planning group at Wright Field (which replaced McCook Field in 1927), and after further evaluation, was surveyed in September, 1929. The XP-6A was an XPW-8A, built in 1925 but not flown until the new engine was developed. Certainly in appearance the XP-6A did not belong to the P-6 family.

The XP-6, which placed second in the Free-for-all Race, was not noticeably different in appearance from the P-1, its immediate ancestor. In fact it was a P-1 which had been converted to a P-2 and then to an XP-6 by installation of a V-1570-1 Conqueror engine. This aircraft, incorporating experimental cooling fins on the radiator cowl, an air speed indicator and a free air temperature indicator on the wing struts.

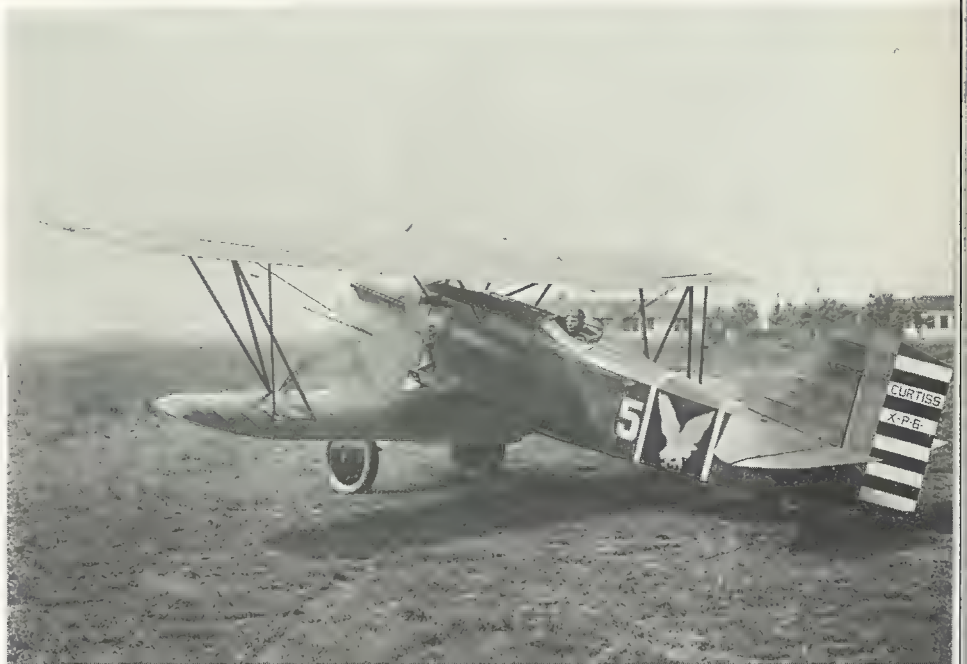
Although the XP-6 averaged just a shade under 190 mph in the National Air Races, its top speed in level flight under service conditions was 176.2 mph at 2330 rpm. at sea level. Gross weight of 3037 lbs. for its official performance test on May 14, 1928, (at which time the above speed was clocked) did not include fixed guns but did take into consideration 230 lbs. of ballast. It seems probable that both the XP-6A and XP-6 attained the high speeds noted above for the National Air Races by "doctoring" the engines to attain greater horsepower. Since the 120 mile race included pylons which required tightly banked turns, the straightaway speed of these race craft was naturally higher.

Captain St. Clair Streett's report on the XP-6 revealed that the windshield was unsatisfactory and did not provide enough protection for the pilot. When banked, the aircraft had a tendency to remain in a spiral dive rather than return to normal flight attitude. He concluded that the XP-6 was rather unstable with power on, but with power off, would assume a normal path. Streett was a relatively short man and found the lack of adjustment for the pilot's seat a distinct disadvantage. He had to pile cushions onto the seat to gain the proper height for visibility, and discovered the controls were too far from the seat for any but the tallest pilots.

Actually, these complaints were of a relatively minor nature, and with the exception of the slight instability encountered, easily corrected.

(continued on page 6)

Curtiss XP-6 took second place at 1927 races; was forerunner of P-6 series.



WASHINGTON AND THE INCEPTION OF AERONAUTICS IN AMERICA

By

Sidney I. Pomerantz

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High among the contributions of the Founding Fathers to the cultural life of the new nation was the notable part many of them had in the promotion of scientific inquiry. Popular interest in probing the laws of nature was considerable in the eighteenth century and independence proved an added incentive to experimentation. Now, more than ever, Americans were eager to match the remarkable achievements of European inventive genius. Especially was this desire for distinction in evidence in the excitement engendered by news from abroad of developments in the field of aerostation, as ballooning was at that time called. This spectacular invention had aroused intense curiosity on both sides of the Atlantic, and scientifically-minded Americans anxious to further its improvement found willing support from the country's foremost citizens. Not least among them was George Washington, who was deeply impressed by the aeronautical accomplishments of the Old World, and not only gave expression to his views in this regard, but played a prominent role in the sponsorship of the first successful balloon ascension and voyage in America.

When, in the spring of 1784, Washington was invited to attend "A Lecture on Pneumatics" by Dr. John Foulke, a young Philadelphia surgeon recently returned from abroad, Americans, even then, were not entirely unfamiliar with the aeronautical pioneering in France. It is not surprising, therefore, that the nation's largest city should promise a receptive audience for first-hand information about aeronautical doings in Paris.

To this task, Dr. John Foulke, newly-elected in January of that year to membership in Philadelphia's American Philosophical Society, applied himself. His previous training, European studies, and learned associations gave every indication that he could take a responsible and stimulating part in the promotion of an interest in aerostation. Nor did he fail to appreciate the historic significance of his opportunity to do so, assuming an initiative in this respect that did credit to his scientifc professions. According to Francis Hopkinson, a fellow-member of the American Philosophical Society and a leading aeronautical enthusiast, Dr. Foulke was the first to make a paper "air balloon," which ascended "from the garden of the Minister of Holland" on May 10, 1784. While these experiments were going forward, Dr. Foulke announced his "Lecture on Pneumatics" to be held "in the Hall of the University" of Pennsylvania on the seventeenth of that month. In keeping with the importance of the occasion, George Washington, then in the city of Philadelphia, was asked to be present.

Well might Washington have accepted the invitation and added luster to the meeting. In so doing he would have given encouragement to an inquiry near to his own expressed interest and that of other distinguished men of the day. Only the month before, he had written from Mount Vernon to General Duportail in France:

> I have only newspaper Accts. of the Air Balloons, to which I do not know what credence to give; as the tales related of them are marvellous, and lead us to expect that our friends at Paris, in a little time, will come flying thro' the air, instead of ploughing the ocean to get to America.

Moreover, Dr. Foulke's reputation was such as to guarantee the fulfillment of the promises held forth in the newspaper advertisement describing the nature of the lecture. It was his intention to explain "the properties of inflammable, nitrous, fixed airs, &c.," to exhibit "a great variety of aerostatic globes," and to suggest "the uses to which Mons. de Montgolfier's ingenious discovery may be applied." Tickets of admission were one dollar each. Scion of an old Quaker family, a graduate in medicine of the University of the State of Pennsylvania, well known to Franklin, who had befriended him during his years of residence and study abroad, Dr. Foulke could be counted on to live up to the finest standards of eighteenth-century scholarship. Washington may have been informed of all this. Certainly Foulke's association with Franklin and his grandson and secretary, William Temple Franklin, while in Paris, had served to sharpen his intellectual interests, and won for him the respect then accorded Americans who had completed their education in the Old World.

Dr. Foulke had come to Paris in the summer of 1780 with a sheaf of letters of introduction to the two Franklins. The letters were uniformly high in their praise of the character and ability of the twenty-three year old physician, but, since he had not participated in the War of Independence, though a Whig, and had many Tory connections, Francis Hopkinson and Franklin's son-in-law, Richard Bache, entered a word of caution. There was no such warning, however, from Dr. Benjamin Rush, who effusively wrote Benjamin Franklin that the young Quaker "carries with him the good wishes of thousands." Dr. Foulke was soon caught up in the whirl of social activities and scientific pursuits emanating from the Franklin household. His indebtedness to Benjamin Franklin came to be considerable, and, in gratitude, Foulke paid fulsome tribute to him as "that great Parent of Mankind, Father of his Country and Protector of Science." Dr. Foulke's years abroad included some travel on the continent and a visit to London in the spring of 1783 for medical study. Returning to the United States, Foulke plunged into the practice of his profession with enthusiasm and confidence. On November 22, 1783, he announced in the press that "at the particular request of a number of medical gentlemen," he would give "a course of practical anatomy, dissection and preparation"; and "those gentlement who wish to attend him, will please to call at his house in Front-Street opposite the City Vendue-Store, where they may be informed of the terms and time of commencement." Dr. Foulke was on the threshold of a notable career in medicine. But, like many a physician of his day, devotion to his specialty did not preclude a lively curiosity about science in general. Though he had complained of illness abroad, he found the energy to serve the public well and to play the part of an eighteenth-century savant.

It is not unlikely that Washington was eager to hear the lecture that Foulke had prepared. Given the background of the speaker, its scholarly sponsorship, and the convenience of the time, a Monday afternoon at four o'clock, the lecture would be an attractive respite from the proceedings of the Society of the Cincinnati over which Washington was then presiding and which had been the occasion of his visit to Philadelphia. It promised, too, to answer, in a way no newspaper account could, the many serious questions as to the possibilities and limitations of ballooning. This would be an event indeed for all those whose imaginations had been stirred by the new art of aerostation. But, at what must have been, in that less-hurried age, "the last minute," Washington sent his regrets:

> Genl. Washington presents his Compliments to Doctr. Foulke—thanks him for his polite Card & Ticket—and would with great pleasure attend his Lecture on Pneumatics, but the business which brought him to this City does not leave him at liberty, as the Members of the Cincinnati are anxious to bring it to a close.—
>
> Monday Morning.

While the nature of Washington's activities prevented his attendance at the Foulke lecture, it did not end, by any means, his definite interest in aeronautical matters. It is apparent, for example, that ballooning was still very much on his mind when, in writing from Annapolis, on December 23, 1784, to the Marquis de Lafayette, he remarked: "I as little expected to cross the Potomac again this winter, or even to be fifteen miles from home before the first of April, as I did to make you a visit in an air Balloon in France." Washington had come to Annapolis with General Gates to represent the Virginia Assembly in discussions with the Maryland legislature "respecting the extension of the inland navigation" of the Potomac River, negotiations that were to prove momentous for the future of the nation.

The next year, in a letter from Mount Vernon to Sir Edward Newenham, Washington, while expressing his concern for the willingness of that gentleman to risk an aerial voyage, nevertheless felt that encouragement was due those young men "of science and spirit" who wished "to explore the upper regions:"

> . . . the observation there made may serve to ascertain the utility of the first discovery, and how far it may be applied to valuable purposes. To such *alone* I think these voyages ought at present to be consigned, and to them handsome public encouragements should be offered for the risk they run in ascertaining its usefulness, or the inutility of the pursuit.

As for Dr. Foulke, though he turned to other subjects after his initial enthusiasm, his experiments and lecture proved a stimulating prelude to several ambitious aerostatic undertakings that spring and summer of 1784. On June 11, at a meeting of the American Philosophical Society, it was moved by Dr. John Morgan that the members support "an effort to send up a large air balloon." No action was taken then, and at the next meeting, June 19, the motion was withdrawn, though Dr. Morgan did present a paper on balloons. But, if no formal action was taken by the Society, the members individually were extremely active at this time in promoting a project for launching "A Large, Elegant Air Balloon." Whether Foulke was among them, the records do not reveal, but Francis Hopkinson, Dr. Rush, Dr. Morgan, and other eminent Philadelphians were prominent in the effort.

Even before this elaborate scheme was launched, Peter A. Carnes, a well-to-do Maryland landowner and lawyer, inspired by the success of the Montgolfier brothers with hot-air balloon, constructed one himself, and, on June 12, from Bladensburg, announced that his "American Aerostatic Balloon" would "be exhibited in a field near Philadelphia, on the 4th of July next, if fair, if not, the next fair day." This aerostat was to make aeronautical history at Bladensburg, where it was originally experimented with that June, and at Baltimore, where on June 24 it actually carried a young boy of thirteen, Edward Warren, aloft. In advertising the Baltimore exhibition, Carnes declared that his balloon, which was nearly thirty-five feet in diameter and about thirty feet high, could carry two persons, and that it was his purpose "to ascend above the clouds." "Made of Silk of various Colours, with a cylindrical Stove of Iron suspended at the Bottom, by which the internal Air is rarified,' as an enthusiast described it, the aerostat seemed sturdy enough to tempt the adventurous, especially so since it was held captive, and could be brought down at will. With a confidence born of his Bladensburg and Baltimore experiences, Carnes came to Philadelphia, where, finally, on July 17, he personally attempted an ascension, with disastrous, if spectacular, results.

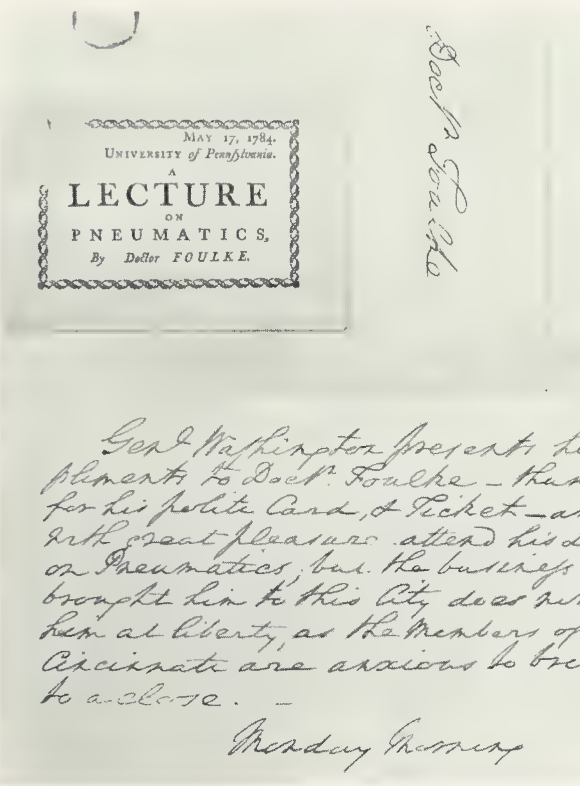
Heralded in advance by a constant barrage of press notices, "The American Aerostatic Balloon," with Carnes aboard, rose from the "New Work House" yard the evening of the seventeenth, but some ten to twenty feet up Carnes was thrown clear as the machine hit the prison wall. Thereafter, the aerostat ascended to an astonishing height, then, some minutes later, burst into flames, "was entirely consumed, and the furnace, iron work, &c. in the space of about five minutes more, fell to the earth." Despite this misadventure, there was no diminution of public interest in the future of ballooning, nor any attempt to minimize Carnes' "noble, great and laudable" intentions. Whatever his hopes, the result had been failure, giving a renewed stimulus to those who had been seeking subscriptions originally for "a large elegant Air Balloon, capable of raising great weights, and of carrying up men and . . . animals into the atmosphere." It was felt that Carnes' balloon was "of too flimsy a texture" for this purpose, and that public support was insufficient "to make it stronger." Another approach was needed:

The undertakers of the Subscription-Balloon, which now, once more, bespeaks the contenance and support of the lovers of philosophy, and the curious investigators of nature, have no doubt but they shall have it in their power to guard against those defects and accidents, to which a private undertaking so great and important must be liable. As they intend to construct their aerostatic machine on a scale befitting the metropolis of one of the first states in the union, . . . they can entertain no apprehensions that they shall not meet with the . . . support of the officers of government, who, as first in dignity and trust, ought to be foremost in improving every discovery which has a tendency to reflect credit upon the people over whom they preside. . . . The citizenry, too, was asked to join with government officials "to advance the interest of science," so as not to let the nations of Europe outshine America. Plans called for a balloon of sixty feet diameter, made of fine, strong linen, and strengthened with the addition of a net-work covering.

Though it had been emphasized in the very first announcement of plans for the Subscription-Balloon on June 19 that its sole aim was the advancement of knowledge by "the enlightened and patriotic sons and daughters of American freedom and science," an endeavor that "will tend to exalt our national character for philosophy and love of science," the general response was not as great as expectations warranted.

(continued on page 8)

Copy of original letter in which Washington sends his regrets to Dr. John Foulke.

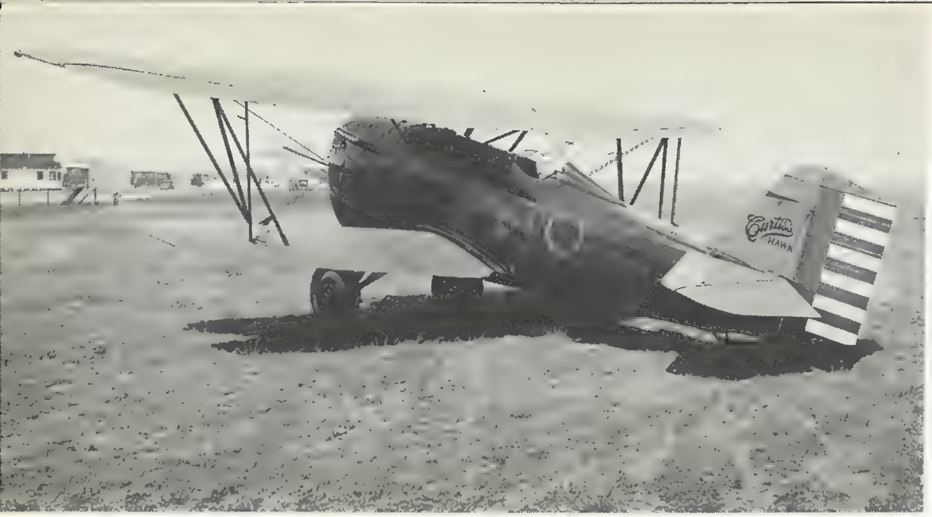


May 17, 1784.
University *of Pennsylvania.*
A
LECTURE
ON
PNEUMATICS,
By Doctor FOULKE.

Doctr Foulke

Genl Washington presents his Compliments to Doctr. Foulke — thanks him for his polite Card, & Ticket — and would with great pleasure attend his Lecture on Pneumatics, but the business which brought him to this City does not leave him at liberty, as the Members of the Cincinnati are anxious to bring it to a close. —

Monday Morning



The "Hoyt Special," an XP-6B flown from New York to Alaska by Capt. Hoyt in 1929.

(continued from page 3)

Experimental flights with the XP-6 continued for some time. On November 11, 1929, Capt. Streett again reported on a flight:

"The subject airplane was flown with auxiliary tank full, and with the full military load, to note tail heaviness and tendency to ground loop. The airplane is slightly tail heavy in this condition, but not excessively so. This tendency can be easily corrected by use of stabilizer adjustment. No tendency to ground loop was noticed, although the airplane was not landed in a cross wind. Further landing tests will be continued under various conditions of wind, to note any possible tendency to ground loop, following completion of performance tests."

The Air Corps felt the XP-6 design had promise, for in fiscal 1929, $628,310 was appropriated for the purchase of 12 YP-6's and 9 P-6A's and spares. An additional sum of $380,905 was appropriated for 36 Curtiss V-1570 engines to power the P-6 and to serve as spares.

The P-6 was a refined version of the XP-6, incorporating bottom fuselage fairing aft of the radiator to provide a more streamlined appearance. In addition, three longitudinal tubes installed on each side of the fuselage structure, and others forming the rounded upper deck aft of the cockpit, resulted in a somewhat elliptical cross section aft of the engine. The shuttered, slab-sided radiator and spinner still gave the nose the sharp, hawk like appearance that distinguished the P-1, but with the deeper and apparently sturdier fuselage, the P-6 presented a more modern and rugged combat aircraft. Its top speed of 176 mph was an improvement over the P-1's 163 mph, although the increase was due to sheer power from the 600 hp Conqueror as compared to the D-12 engine of approximately 435 hp that powered the P-1.

A seat, adjustable vertically, fore and aft, and for tilt angle, probably made Capt. Streett happier. Toe operated brakes were attached to the rudder pedals as standard equipment, which indicated that the objections outlined in Major Martin's letter to General Gillmore in January, 1927 were overcome. At that time he stated . . . "It it not believed that brakes have reached a sufficient point of development where it would be safe to install them on all Curtiss airplanes now under construction . . ."

Although only two mph faster than the XP-6, slower climbing and not capable of attaining the ceiling of its predecessor, the P-6 was a service aircraft, almost 300 lbs. heavier than the XP-6. Its ruggedness and reliability was demonstrated by the New York to Nome, Alaska flight in July, 1929. Capt. Ross G. Hoyt, flying a XP-6B, took off from Mitchell Field with 250 gallons of fuel and flew to Minneapolis in seven hours, despite strong headwinds. Stopping only to refuel, he then spanned the 1100 miles to Edmonton, Alberta, most of this leg being flown at night. Hoyt then flew to Whitehorse, Fairbanks, and finally Nome. Elapsed time was 38 hours, flight time 34 hours and 20 minutes. Seventeen minutes after landing at Nome, Hoyt started the return trip. He arrived at Fairbanks three and one-half hours later, and rested there four hours. Then on to Whitehorse, which was reached three and one-half hours after take-off from Fairbanks. However, on the next leg, condensation of water in the fuel tanks caused the engine to fail. A forced landing was made in a clearing and damaged the aircraft to the extent that further flight was impossible. Despite this mishap, the suitability of the P-6 as a mobile weapon for continental defense was proved, as well as the reliability of the Curtiss aircraft and engine. As for Capt. Hoyt, his stamina and ability typified the airmen of the small but effective Air Corps of that day.

The XP-6B which made this notable flight was a hybrid, the forerunner of the P-6A in appearance with the exception of a bulkier nose, housing the water radiator.

In October 1929, Curtiss requested permission to sell two P-6's to the Siamese Government. It had been a policy of the U.S. Government to allow export sales one year after delivery to the Air Corps or Navy, and eventually an export permit was granted to Curtiss on the P-6, for a brochure was published listing the models available.

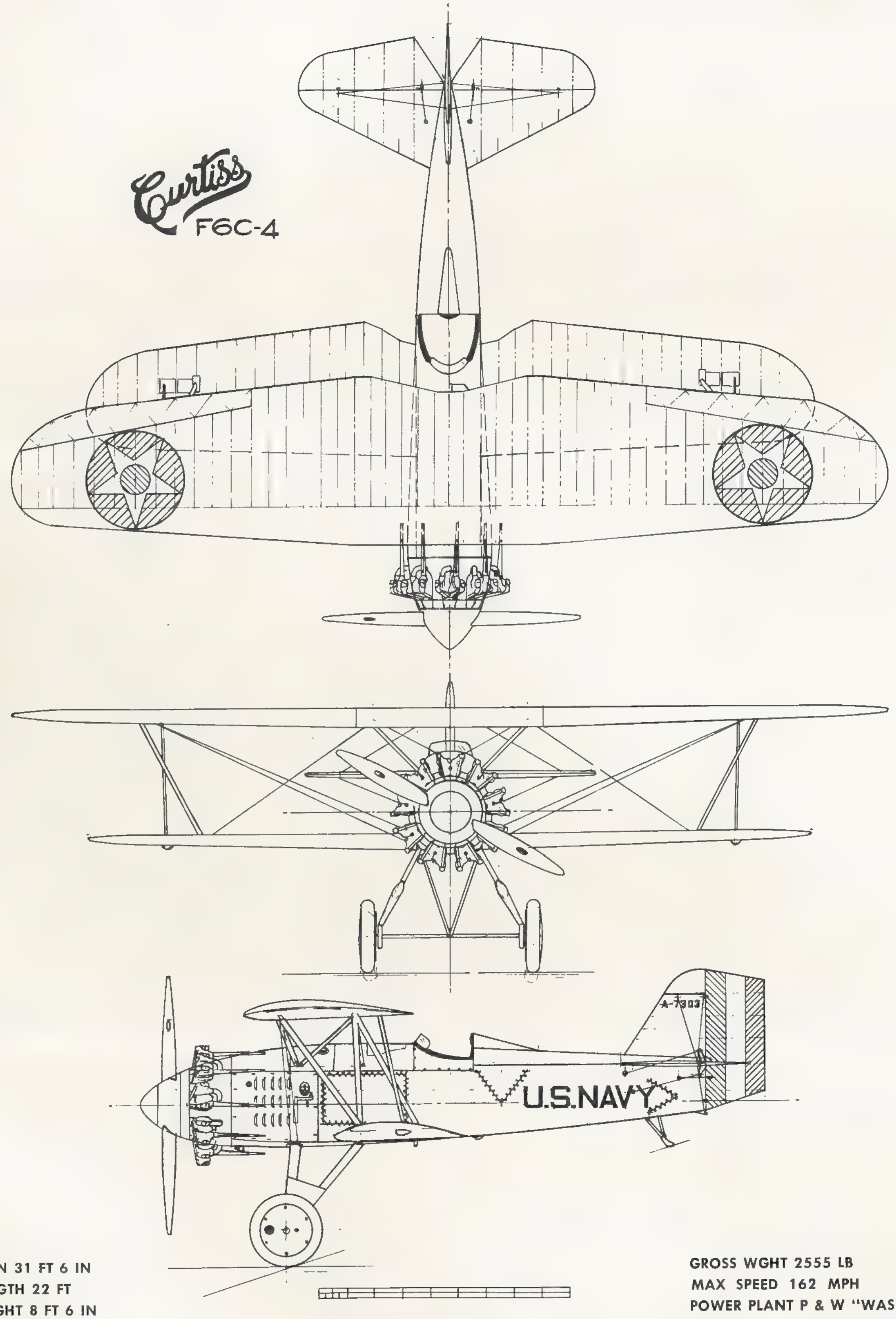
In addition to the standard P-6, a special Hawk featuring a high compression Conqueror engine of 675 hp was offered. This model of 3294 lbs. gross weight had a top speed of 186 mph at sea level, which tapered off to 158 mph at 20,000 feet. Initial climb was 2380 ft./min and 15,200 ft. was reached in 10 minutes. A service ceiling of 23,500 ft. and endurance at full throttle of 1.72 hours with 100 gallons of fuel was also advertised.

A third Hawk for export weighed 2910 lbs. had a 450 hp P & W engine with a 157 mph top speed at sea level and 126 mph at 20,000 ft. Initial climb of 1820 ft/min, 12,500 ft. in 10 minutes, service ceiling of 21,800 ft. and endurance of 2.54 hours at full throttle with 100 gallons of fuel were the performance statistics for this radial engine model.

This may be an appropriate time to mention that the study of the Curtiss P-6 series can be most confusing. The development of these aircraft extended over a ten year period, and much shuffling of designations and over-lapping of experimental models occurred. There are undoubtedly several of the latter on which the data has not been obtained, but it is believed that this article covers a large majority of the models.

(To be continued)

Demonstrator version of "Hawk" displayed familiar Curtiss trademark.



SPAN 31 FT 6 IN
LENGTH 22 FT
HEIGHT 8 FT 6 IN

GROSS WGHT 2555 LB
MAX SPEED 162 MPH
POWER PLANT P & W "WASP" 425 HP

(continued from page 5)

An original plan had been to use hydrogen, then referred to as "inflammable air," to inflate the large balloon, or, at least, a small experimental aerostat, but after Carnes' debacle, the sponsors apparently decided on a hot-air machine. In the end, the whole idea seems to have been abandoned, as there is no further mention of the Subscription-Balloon in the newspapers. It is likely that subscriptions came in too slowly and fell "far short of the estimate of expences." Obviously the launching of such a project called for a degree of entrepreneurial talent not readily available. Members of the American Philosophical Society, from whose ranks such leadership could have come, were occupied with other pursuits. In the next half-dozen years the minutes of that Society touch on the subject but once, and then in connection with advice being asked concerning balloons of metal. It remained for a visitor from abroad to give a practical demonstration of the wonders of flight.

Jean-Pierre Blanchard, Europe's famed aeronaut, arrived in Philadelphia early in December 1792, and proceeded forthwith to enlist the help of the great and near-great, the learned and the curious, the rich and the poor in plans for an aerial ascension. His previous triumphs guaranteed almost certain success, and he left no trick of showmanship unturned to stir up public excitement. Quick to sense the high drama of the role he was playing in the capital of the young nation, Blanchard sought the patronage of the President himself, the governor of the state, the French minister, and other notables. According to available records, they did not begrudge him this honor. There is a question, however, about Washington's actual presence in the yard of the Walnut Street prison on the morning of January 9, 1793, when Blanchard began his celebrated flight. Back in the 1920's Randolph G. Adams saw a letter in a dealer's shop to the effect that Washington regretted he could not attend, "that a meeting of the Order of the Cincinnati, or some . . . committee, has forced him to decline the pleasure. . . ." But the weight of evidence is against this suggestion that the President did not come in person, and it would seem that this description fits the contents of the letter of 1784 to Dr. John Foulke, as, despite search, no other letter has come to light. Moreover, the fragment of information about the Cincinnati must be eliminated, as that Society held its "Fourth Triennial General Meeting" in Philadelphia on May 6 and 7, 1793, and not in January. In fact, though Washington was elected president-general at the meeting, the proceedings do not even list him as being present.

It is unfortunate that there is no clue to the events of January 9 in Washington's own writings, though Fitzpatrick does reprint the "passport" given to Blanchard that day by the President. However, on the positive side, account must be taken of Washington's lively interest in ballooning, nor must we discount Blanchard's warm tribute to the President for "the gracious reception" with which he "was welcomed by the hero of liberty, General George Washington." Of course, Blanchard's *Journal* of his forty-fifth ascension, for such it was, contains a convincing description of Washington's participation in the prison yard preliminaries:

> I hastened to take leave of the President, and of Mr. Ternan, Minister Plenipotentiary of France to the United States. I then received from the President the most flattering mark of his good will in the passport which he was pleased to deliver me with his own hand. . . .
>
> The moment of my departure was announced by the last discharge of the artillery; I then ascended my car. . . .

The newspaper stories are equally specific as to his presence. One of the best of these, an eye-witness report, was published the very day of the ascent:

> At last, every thing being ready, M. Blanchard respectfully took his leave of the President, who gave him a folded paper, which we suppose to be a recommendation to the inhabitants of whatever place he may light upon. After he had taken his leave, the president called him back and said something to him that we did not hear. Then the aeronaut having bowed to the spectators, ascended his boat, which was painted blue and spangled with stars on the outside, and holding in his hand a flag, with the colours of the United States, he threw out part of his ballast, and precisely at 5 minutes past 10 o'clock, the balloon rose slowly and perpendicularly to soft music, amidst the shouts & bursts of applause of all the spectators. The President took off his hat, and bowed to him as he ascended.

Blanchard's flight lasted forty-six minutes and carried him some fifteen miles to a clearing near Woodbury, New Jersey, where he descended. Returning by horse, carriage, and boat to Philadelphia that evening, he hastened to pay his respects to Washington. "I had the honor," wrote Blanchard in his *Journal,* "to offer him my colours, which he politely accepted, and thereby acquired a fresh claim to my gratitude." Later that year the Philadelphia printer, Charles Cist, brought out Blanchard's *Journal* of the ascension, dedicated, appropriately enough, "To George Washington, President of the United States of America, the Patron of Liberty, the Laws, and the Fine Arts."

Not only Washington but Thomas Jefferson came within the orbit of Blanchard's attentions. The Secretary of State, duly impressed by Blanchard's daring and skill, seems to have shown the aeronaut some friendliness. It was enough, at least, to prompt the financially embarrassed Frenchman to press Jefferson to intercede with the President to extend a loan of $400. Writing to Jefferson in October of that eventful year, in the midst of the devastating yellow fever epidemic that had infested Philadelphia, Blanchard bewailed the series of misfortunes that had been his since the great ascension. The public subscriptions had been so poor for the first and subsequent exhibitions that he had been forced into debt. As a stranger in the land, he had no one to turn to, and so he appealed to Jefferson, because "you alone in this country, can appreciate artists and their troubles." Outlining some of his plans to recoup his losses, Blanchard hoped to pay back the loan "before next Spring," anticipating a much better reception "in the other cities on the continent." Some weeks later, having received no reply, Blanchard wrote again, expressing fear that the letter had gone astray, "since the greatest personages of Europe have never neglected" answering me.

Jefferson replied quickly enough this time, explaining that the letter of October 16 had been delayed in reaching him, as he had been in Virginia. Concerning "the application to the President which you desire me to make," it "is entirely foreign to my *official* relations with him." In conclusion, Jefferson wrote with sincere regret:

> I wish that my own resources were such that I might from them have accomodated you with the sum you desire, but I am about to leave this place within a few days, and on summing up my affairs I find my engagements so much more than I had expected as to place me under real difficulty to provide for them.

Despite this unhappy dénouement, Blanchard continued to carry on, finding in other American cities men still willing to lend him material encouragement. But he never succeeded in making another aerial voyage in the United States.

Almost a decade had elapsed since Dr. John Foulke had formally brought the aerostatical knowledge of the Old World to the attention of the New. About that time, Benjamin Franklin, writing from Passy to Sir Joseph Banks, President of the Royal Society in London, had predicted that the art of flying "may be attended with important Consequences that no one can foresee." And so it proved to be in many ways, though not precisely in the form envisioned by the eighteenth-century enthusiasts of the science. For the men of that day, aerostation was "one of the grandest, most beautiful and most useful discoveries this age has produced." In this sentiment, from the fullness of their own knowledge, Washington and Jefferson would have concurred, Blanchard's trials and tribulations notwithstanding.

Complete documentation of the foregoing paper is available in the Proceedings of the American Philosophical Society, Vol. 98, No. 2, April, 1954.

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Aeronautica

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CONTENTS

Volume 7 **Number 1**

FEATURES

Fokker in the United States (Part One) by John Sloan 3
The Birth of Speed (Part Four) by Jack D. Canary 6
The Gloster VI "Golden Arrow", Three-view by Dustin Carter 7

DEPARTMENTS

Courtney's Corner 2

EDITORS

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COURTNEY'S CORNER

FLYING IN CIRCLES

By
Frank T. Courtney

Man's earliest dreams of flight were, of course, inspired by the birds; so to fly you had to flap. Daedalus, Icarus and Pegasus flapped their way around the classic skies unimpeded by propellers or wheels. Nobody could imagine angels hanging from rotors or tearing along celestial runways, so they were given lovely wings which they flapped with great efficiency, regardless of center of gravity location. It was natural, therefore, that early "flying machine" conception tended towards flapping wings.

However, assorted flapping projects generally produced more hilarity than lift, and the idea grew that wing flapping was strictly for the birds. Mechanically minded pioneers preferred wheel action to limb action; some took to the propeller and some to the helicopter. Transportation's great seer, Jules Verne, fitted his "Clipper of the Clouds" with a multiple helicopter system of support.

The runway idea was not readily accepted; even Langley and the Wrights used launching gear at first. But even as runways developed as part of the fixed-wing concept, the necessity for the direct-lift aircraft became increasingly obvious for purposes which fixed wings could not serve. So helicopter efforts never died.

Then a young Spanish engineer, Juan de la Cierva, made the first firm step towards a practical helicopter with his invention of the Autogiro. The importance and brilliance of this step has been largely obscured by the passage of time and the small practical utility of the Autogiro itself. The Autogiro did many things for the helicopter. By using a rotor which was not power-driven (an idea which, apparently, was totally new) it enabled the problems of rotating wings to be studied by themselves, free from the complications of vibration, torque, gearing, power impulses and other effects of the power plant which were confusing and obscuring the whole rotor design problem.

To illustrate how new the idea was: When I first joined Cierva in his early experiments, one of England's foremost aerodynamicists told me the idea couldn't possibly work ("The wings would obviously turn the wrong way"), and we had to bring British Patent Office officials to Farnborough to witness a flight before they would grant the British patent. ("The claims contradicted principles which they believed were well established".)

The "flapping hinges" of the blades had been tried before in an unsuccessful helicopter effort, but their value in distributing lift and suppressing gyroscopic forces had been missed in the whole complexity of the power-driven contraption. The "drag hinges" resulted from my losing a blade in flight through fatique action which was easily studied in the absence of power impulses and vibration. The problem of what a helicopter would do if it lost power was no longer a problem; autorotation would take care of that, a thing which few people, if any, previously realized.

I first met Cierva in Spain in 1924 when his freak "windmill" was good for a few laughs in the Palace Hotel Bar. When, the next year, he found England more suitable than Spain for experimental aviation, I took over his test flying and for the greater part of two years I was the world's only pilot of rotary wings. We learned about rotors and blades the hard way, with numerous crashes, some funny, some not so funny.

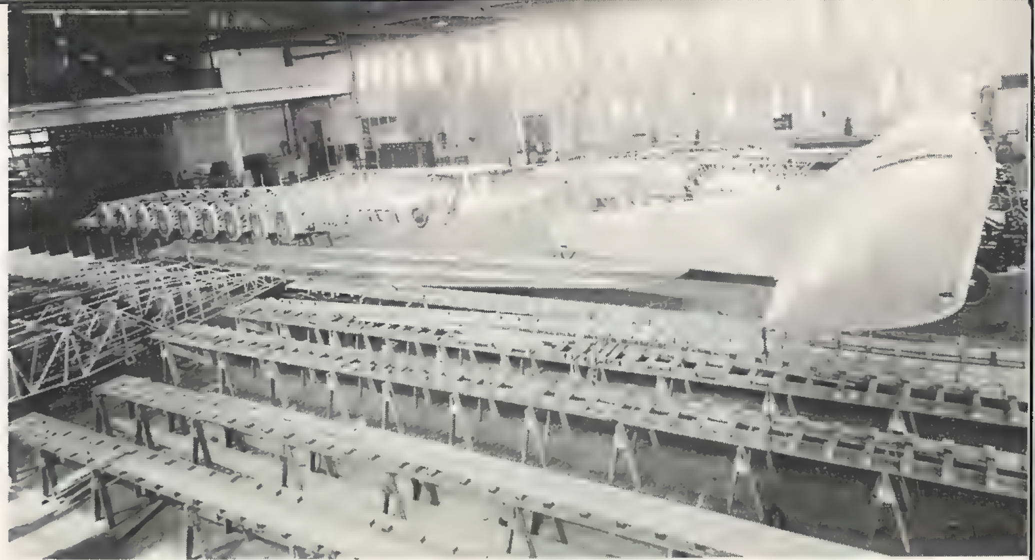
The successful helicopter would, of course, have eventually appeared if Cierva had never been heard of, but it is beyond question that his genius and perseverance advanced the art by very many years.

Frank Courtney with early Cierva Autogiro, Farnborough, England, Sept. 1925

FOKKER IN THE UNITED STATES

By
John Sloan

PART I



Inside Hasbrouck Hts. plant, 1926. Note DH-4-M2 frames and early C-2 Trimotor

The name of Anthony Fokker is linked with the romance of aviation as perhaps no other personal name has ever been. Although he was an international figure, he was as well known here in the United States as Lindbergh, Byrd, Curtiss, the Wrights, Rickenbacker, or any other aviation figure of the years 1916 to 1931. Among the less-informed press, every German airplane of World War I is described as a Fokker, and the confusion between the Fokker and the Ford Trimotor was never resolved until after the tragic incident which brought to a close the career of Fokker in the United States.

What was the basis for such reknown, even popularity? It was the combination of the skillful pilot, the master mechanic, the inventor, and the shrewd business man. Although he has been called a genius, it is apparent that Fokker was a hard worker who knew what he wanted to do—to build airplanes. Fame and money merely became the mark of success.

The career of Anthony Herman Gerard Fokker in this country was short, especially the period between War's end and 1931. He came to the United States both famous and infamous. Europe was recovering from the devastation of war and the real market for airplanes should have been here. The Atlantic Aircraft Corp. was established to build aircraft of Fokker design, and within a few years, having made his mark, the name was changed to Fokker Aircraft Corp. It came to an end in 1931 when General Motors money bought the Corporation and it became General Aviation.

Fokker learned to fly in 1910. In fact, he taught himself, having built his own airplane to do so in, and he went on to become one of the foremost skilled pilots of the time. Stability was one of the strong points of his designs. His first airplane, the Spider, was quite stable and he could fly, as he himself quoted, "when there was a strong wind of 4 or 5 miles an hour." In his most famous airplane of the World War, the D.VII, the stability and control were excellent, as exemplified by that maneuver in which the airplane could be made to hang on its propeller while traveling forward at a speed of 30 miles per hour.

During World War I Anthony Fokker built many airplanes for the Central Powers, invented the interrupter gear for firing machine gun bullets between the blades of a propeller and reached the ultimate satisfaction of having his D.VII model built in quantity by other manufacturers, his rivals.

When the War was over he at once built his first postwar commercial type airplane, the F.II, while still in Germany. During his now famous escape from Germany, in which six trainloads of lumber, fabric, metal, engines, whole and partially complete airplanes were smuggled across the border to Holland, the F.II was flown across. It became the Basic design which typified all of Fokker's commercial monoplane jobs to follow.

In Holland, Fokker assembled his smuggled planes and sold most of them to the Netherlands Air Force. These were mostly D.VII's and C.I's, the latter being two-place D.VII types with slightly larger wings.

Those of you who have read "The Flying Dutchman" will remember Fokker's anecdote on the Paris Aero Show of 1919, and how the repainting of his glider on display had not entirely concealed the Dutch insignia. He was afraid that this would raise further uproar over his having been an aircraft maker for the Germans during the War. It was under this cloud that he appeared at Dayton, Ohio in 1920 for the purpose of selling some of his airplanes to the U.S. Air Service. Most of the Air Service officers then remaining in the Air Service were not combat veterans and were not especially concerned that he had built airplanes for Germany during the War. The resentment expressed was from groundlings without the respect for his genius that his aircraft engendered.

At any rate, Fokker got his foot in the door, and in 1922 he brought over from Holland the PW-5, PW-6, XCO-4 and TW-4 (Air Service designations). The TW-4 looked very similar to the PW-5 (V-40), but was a side-by-side two-place trainer, one of the first of such trainers anywhere in the world's military air services. Fokker knew what he was doing here, having had by this time many years of instructing of students and he felt that side-by-side instruction was the most efficient and the best psychologically.

Two other airplanes brought over from Holland in 1922 were the T-2's. One of them is the famous airplane used by Kelly and MacReady in their cross-country flight in 1923, now in the National Air Museum at Washington. The second was modified into an ambulance airplane, the A-2, in 1923. Both were of his so-called F.IV design.

To go back a bit, we will consider the state of aviation in the world in the first few years after the War. Fokker, as seen by the F.II design, was thinking of the postwar commercial possibilities in aviation. Others both here and abroad were likewise, but more along the lines of converted warplanes. As Frank Courtney has related in

Berndt Balchen beside Fokker F.VIIb3m of Colonial Airways, 1926

"The Evolution of Civil Air Transport", the first scheduled aerial passenger traffic in Europe was carried from London to Paris in a converted DH-9 and it was well into 1921 before special aircraft for passenger service began to be provided. Fokker sold his F.II's and F.III's to Dutch airlines and was working on the F.IV by that time. Here in the United States Curtiss had produced a convertible automobile airplane and had shown it at the aircraft exposition in New York in 1919. The Curtiss "Eagle" was also commercial, a design which in looks was far ahead of its time. The Dayton-Wright Company had its "Coupe" design. However, the expected postwar boom in aviation failed to materialize, passengers stayed away in droves and the commercial market for airplanes was, at best, sporadic.

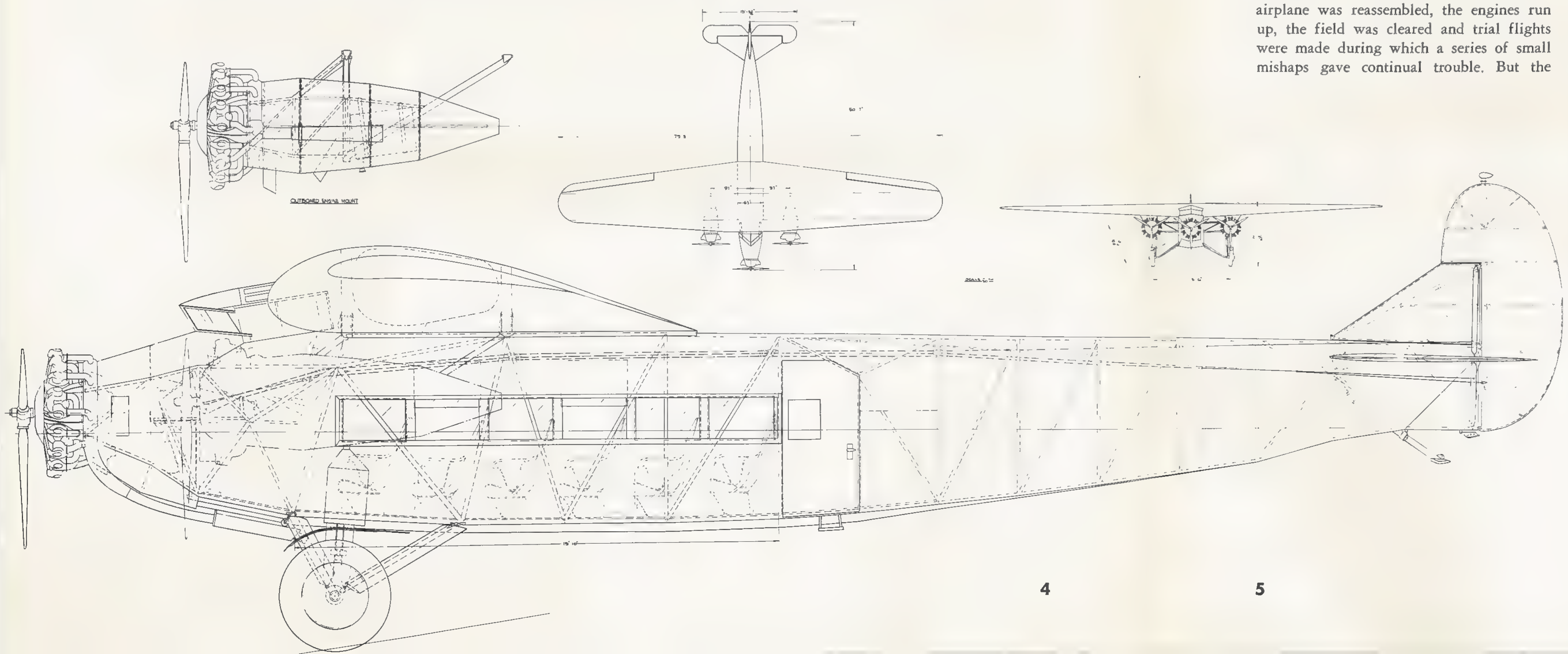
Selling aviation to the public proved to be difficult from the start. Many and varied were the groups trying to stimulate interest in airplanes, racing, air mail, passenger flying, skywriting, and just about anything else connected with flying. There were local air shows, national air races, speed cup races, Liberty Engine Builders' Trophy Races, and Curtiss-Marine Trophy Races. The Air Service was doing its bit by increasing the speed, range, endurance and capabilities of aircraft. Jimmy Doolittle crossed the continent in a DH-4, from Jacksonville, Fla. to San Diego, in 21 hours, 20 minutes. He refueled at San Antonio, Texas. This was Sept. 5, 1922. The next step was, logically, a non-stop crossing.

When Doolittle made his hop, Lts. John A. MacReady and Oakley G. Kelly were even then at work on plans for a non-stop transcontinental flight. In April, 1923 they set a world's record for endurance flying at 36 hours in the T-2. On May 2, 1923 they took off from Roosevelt Field, Long Island and 26 hours and 50 minutes later they landed at San Diego, 2516 miles away. Non-stop long range passenger traffic was at hand. But aside from a few attempts at airline passenger carrying, including Aeromarine Airways which operated for a time in 1921 to '23, and finally suffered severe financial setback due to hurricane damage to its airplanes, commercial aviation limped very slowly until the Kelly Air Mail Act of 1925.

In the field of military aircraft appropriations the picture was very dismal. These had been decreased yearly by Congress and the Air Service could buy few new airplanes. Existing airplanes were modified for new purposes and assigned new serial numbers and, finally, the Air Service was reduced to rebuilding their equipment with maintenance funds. They actually acquired new airplanes, but through completely making new parts with but enough of the old ones from a previous serial number to be able to say that they were "rebuilt".

It was this latter situation which resulted in Fokker's first order for aircraft as a United States manufacturer. It was for rebuilding 100 DH-4 airplanes using his steel tube fuselage method. It became necessary to establish a factory here in this country since procurement of aircraft for the nation's military services from a foreign source, other than experimental, was against U.S. policy. Accordingly he leased the Witteman-Lewis factory at Hasbrouck Heights, N. J. in 1924. The giant Barling Bomber had been finished there the year before. Fokker supplemented the local working force with a number of his employees from Holland who, in the majority, later became U.S. citizens. Photographs taken at successive stages show how wartime-built DH-4's were brought to the plant at Hasbrouck Heights, stripped down, fuselages rebuilt, wings recovered and then assembled and flown away. This work was begun in 1924 and was still under way in 1926 when the first of the C-2 Trimotors were being built for the Air Corps. Other pictures are typical of Anthony Fokker, showing him in the mock-up of a DH-4-M2, which is the designation assigned to Atlantic (or Fokker) rebuilt DH-4's. He was first of all a mechanic and he spent most of his time in the factory, inspecting, approving, changing, and saying, with finality, how he wanted a certain task performed. In these DH-4's he personally established the location of all of the equipment, inspected the arc of vision, position of the seats and gave detailed instructions for manufacture.

Fokker brought his first Trimotor to the United States in 1925, in time to fly along with the first Ford National Reliability Tour. It gained a great deal of publicity for him on the tour and shortly thereafter he went to Dayton, Ohio to show his famous airplane to the Air Service officials. The Trimotor had been built in Amsterdam in accord with instructions cabled by Fokker from New York. It was shipped to the Hasbrouck Heights plant, assembled and tested. To sell the Air Service he turned the Trimotor over to Wright Field officers for any kind of test that they wished to make. This was the first time any manufacturer had ever done so and every officer there wanted to fly it, to take up their wives and children, and every civilian wanted a ride in it.



Apparently Fokker got to the right people for 1926 brought him orders for three C-2 Army Air Corps cargo transports. Later on there were C-2A's and a C-5 and modifications of them into C-7's and C-7A's. One was the "Question Mark" and another the "Bird of Paradise."

From Wright Field, Fokker proceeded to Detroit and apparently it was at this time that Edsel Ford saw and purchased the demonstrator for the North Pole flight of Lt. Comdr. Richard E. Byrd. In the year before Byrd, with Floyd Bennett, had commanded an exploration flight of three Loening amphibians into the Arctic wastes between Northermost Canada and the North Pole. It was a National Geographic Society Survey and the amphibians were lent for the purpose by the U.S. Navy.

Byrd and Bennett began actual preparation for their flight in January 1926 and sailed from New York on the U.S.S. Chantier on April 5th. The Fokker Trimotor was now named the "Josephine Ford" in honor of Edsel Ford's daughter, then three years old. It had by this time already been flown for more than 20,000 miles and was working perfectly. On April 29th Byrd's party arrived at King's Bay, Spitzbergen, which was to be their jumping off point, and found the Amundsen-Elsworth-Nobile group there, awaiting the arrival of their dirigible, the Norge. Thus it became an unofficial race for the Pole.

The landing of the "Josephine Ford" from the ship to the ice was an extremely hazardous affair. Ice in the bay, with danger from further breakup of the ice, and raw, cold weather made a very disagreeable experience for all. Most of the days the temperature was about 15° below zero. The airplane was reassembled, the engines run up, the field was cleared and trial flights were made during which a series of small mishaps gave continual trouble. But the rival party supplied unexpected help. Berndt Balchen, that famous Norseman of the skies, late commander of the U.S. Air Force 10th Rescue Command in Alaska, was then a Lieutenant in the Norwegian Air Service sent along with Amundsen to give technical help because of his considerable experience in snow country flying.

As Byrd and Bennett loaded the "Josephine Ford" for their final takeoff they found that, with the all-up weight, the skiis would not move. It looked as if the expedition might fail at the last moment. Balchen suggested paraffin and resin for the skiis. "I have often done it and it works," he said. The big airplane was divested of some extra flight gear, the fuel and oil were reduced to a merely safe level, and many pounds of souvenirs were hunted out and dropped from their hiding places. It seems that every one in the North Pole Expedition wanted some particular personal object to fly over the Pole. After the skiis were prepared, Bennett opened the throttle and the "Josephine Ford" took off. However, this incident led to Balchen's coming to the United States and his engagement with Anthony Fokker as test pilot for the Atlantic Aircraft Corp.

Fourteen hours and thirty-two minutes later Byrd and Bennett returned to King's Bay, the first men in history to fly over the North Pole on May 9th, 1926.

Following their return to the United States, Byrd and Bennett were both cited for their daring, given a great welcome and later were each awarded the Congressional Medal of Honor and the Hubbard Medal of the National Geograpic Society. The airplane, piloted by Bennett, under the auspices of the National Aeronautic Association and financed by the Daniel Guggenheim Foundation for Aeronautics, went on a tour of the country, as far west as Los Angeles. It was finally brought to rest in the Henry Ford Museum in Dearborn.

By now, mid-1926, Fokker had much work in progress. There were Universal monoplanes under construction for Western Canada Airways and he was setting up distributorships all over the country. C-2's were going to the Air Corps, Capt. (later Sir George) Hubert Wilkins was using a Universal and a Trimotor for his Arctic Expedition, Colonial Air Transport had begun operating an airline between New York and Boston, the Philadelphia Rapit Transit Air Service came and went, and Continental Motors bought a Trimotor for its executive officers. This was the first of the executive transports which are now such a necessary part of American business. It was fitted with imported Turkish carpeting, mahogany panelling, a lavatory and a galley. For advertising and for servicing, Wright Aeronautical bought a whirlwind powered C-III airplane.

In 1926 the whirlwind engine was the most produced radial aircraft Engine in commercial service. It had been developed by Charles L. Lawrance, later president of Wright Aeronautical, and he was awarded the Collier Trophy for it in 1927. There was a very close tie between Wright and Fokker which lasted almost till the end of Fokker Aircraft Corp. in 1931. The C.III brought much publicity to Wright for several years in its various service flights, but the use of Whirlwind on the Trimotors "Josephine Ford", "Friendship", "Southern Cross", "Question Mark", and "America" brought publicity far beyond the best hopes of any publicity agent.

1926 might be called the year of the awakening of American commercial aviation, for in this year there began many of the operations which by now have become the well-known air lines of today. Colonial Air Transport was organized late in 1925 by John Trumbull, Maj. Gen. John O'Ryan, Juan Trippe and Talbot O. Freeman. Berndt Balchen was at that time abroad but soon after he came to the U.S. one of his jobs was the testing of a Colonial Air Lines Trimotor. Juan Trippe later became the head of Pan American Airways. Colonial ultimately became a part of Aviation Corporation, now American Airlines.

Following passage of the Air Commerce Act of 1926, regulation of air commerce and rules governing airways and pilots, and the administration of the postal routes began to attract responsible capital. Some airlines made a go of it, and some didn't.

Philadelphia Rapid Transit was one of the airlines which failed, but it focused attention on two things, the statistics of air passenger traffic and Fokker aircraft. The statistics were important because capital need some idea of the return in order to measure its investment. Thomas E. Mitten, owner of Philadelphia's street railways, launched his PRT Air Service concurrently with the opening of the Philadelphia Sesquicentennial Exposition of 1926. The line just about broke even with a fare of $15 per person each way on the route from Philadelphia to Washington. It was independent of air mail routes but only for a short time.

Philadelphia Rapid Transit bought two Trimotors at first, later added a third. Andre Priester, formerly with the Dutch K.L.M., was manager and the line opened with experienced traffic personnel for ground operations, using buses for travel between downtown locations and the airport. But in spite of expert management the line failed. The fare was not enough to cover capital investment also, and several conditions were in favor of the line which others might not have had in the way of ticket offices and other ground facilities. Mitten obtained the bid for Air Mail Route 13 (later CAM-15) which tided it over until November 30, 1926 but soon after the Exposition was over operations ceased. Its revenue figures became the subject of intense study by others contemplating air passenger service. *(To be continued.)*

THE BIRTH OF SPEED

Part Four of THE SCHNEIDER TROPHY RACES

By Jack D. Canary

Plans for the 1927 Schneider Trophy Contest indicated that it would probably be witnessed by more people than any previous aviation event. The scene of the meet was Venice, and it appeared, up to a week before the race, that three nations would compete. Italy won the 1926 race and, therefore, was "host" for the occasion. An elaborate sea course, similar to the previous Venice contests, was laid out off the Lido. This was a triangular course, to be flown in seven laps of 50 km each.

Much secrecy surrounded the planes to be entered by Great Britain, as the government had finally recognized the international prestige of the contests and had arranged for the construction of six special racing seaplanes. Italy had three Macchi-Fiat M-52 racers that incorporated many improvements learned in the six previous contests. The U.S. planned to enter a Curtiss-Kirkham biplane racer, fitted with a special Packard racing engine, to be flown by noted race pilot Alford Williams. Technical difficulties and disappointing performance in trials led Williams to cancel the entry a week before the race. This left Italy and England to battle for possession of the trophy.

Spectators at the navigability trials on Sept. 23rd were limited to officials of the meet and the technicians responsible for their entrants. Taxi tests and mooring trials were held in a closed area of the port of San Andrea. Here for the first time each country had an opportunity to see, at first hand, the entrants of the other. Great Britain had lost one of its entrants a few days previously, fortunately without injury to the pilot. The machine, a Short "Crusader," powered by an air-cooled Bristol "Mercury" engine, suffered the consequences of inevitable haste and excitement during its assembly and a takeoff was attempted by Lt. Col. W. A. Bristow with the aileron cables crossed. The plane broke water at a high angle of attack, as is normal technique used on float type seaplanes, and one wing immediately dropped enough to hit the water. The pilot, who was thrown clear when the plane somersaulted, had to swim back to the wreckage to hold himself afloat until help arrived.

The remainder of the British team consisted of two Supermarine S-5's designed by R. J. Mitchell. Each was a low-wing, wire-braced monoplane, with a Napier "Lion" VII engine. Three Gloster IVB biplanes, powered by the same type Napier engine also were made available by the Air Ministry. The racing colors of the machines, the scarlet of the Macchi M-52's, the blue and silver of the Supermarine S-5's, and the blue and copper of the Gloster IVB's, formed a striking picture in the Italian sun. The Macchi ships completed their trials, and one Gloster and both Supermarines were chosen by the British. The S-5 numbered N-219 had a direct-drive Napier VIIB engine; N-220 had a geared engine of slightly greater power. Thus, the question of superior efficiency of the geared engine would surely be answered if both S-5's were able to complete the race.

Bad weather postponed the actual contest from Sunday, Sept. 25th to Monday afternoon. The entries for this, the 10th Schneider Trophy Contest, are shown in chart 1.

Flt. Lt. S. N. Webster	(England) Supermarine S-5 Napier "Lion" VIIB 870 hp.	Racing No. 4
Flt. Lt. O. E. Worsley	(England) Supermarine S-5 Napier "Lion" VIIA 800 hp.	Racing No. 6
Flt. Lt. S. M. Kinkead	(England) Gloster IVB Napier "Lion" VIIB 870 hp.	Racing No. 1
Col. Mario De Bernardi	(Italy) Macchi M-52 Fiat AS-3 1030 hp.	Racing No. 2
Capt. F. Guazzetti	(Italy) Macchi M-52 Fiat AS-3 1030 hp.	Racing No. 5
Capt. A. Ferrarin	(Italy) Macchi M-52 Fiat AS-3 1030 hp.	Racing No. 7

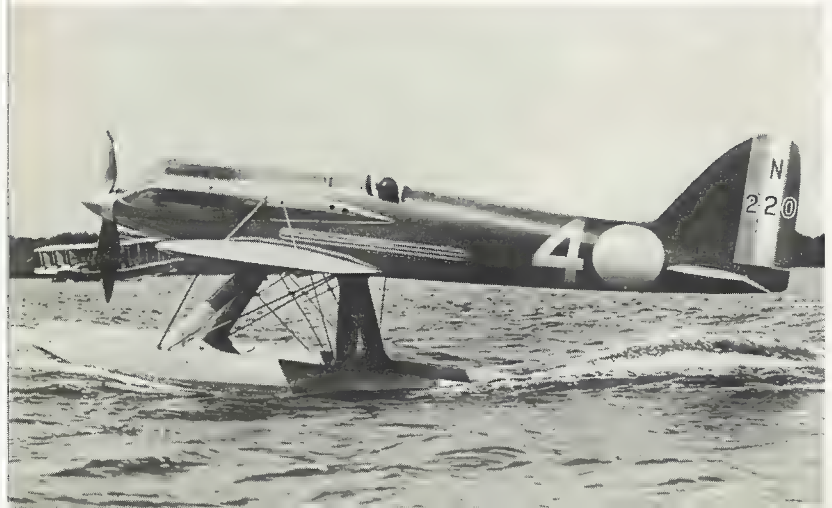
Chart 1

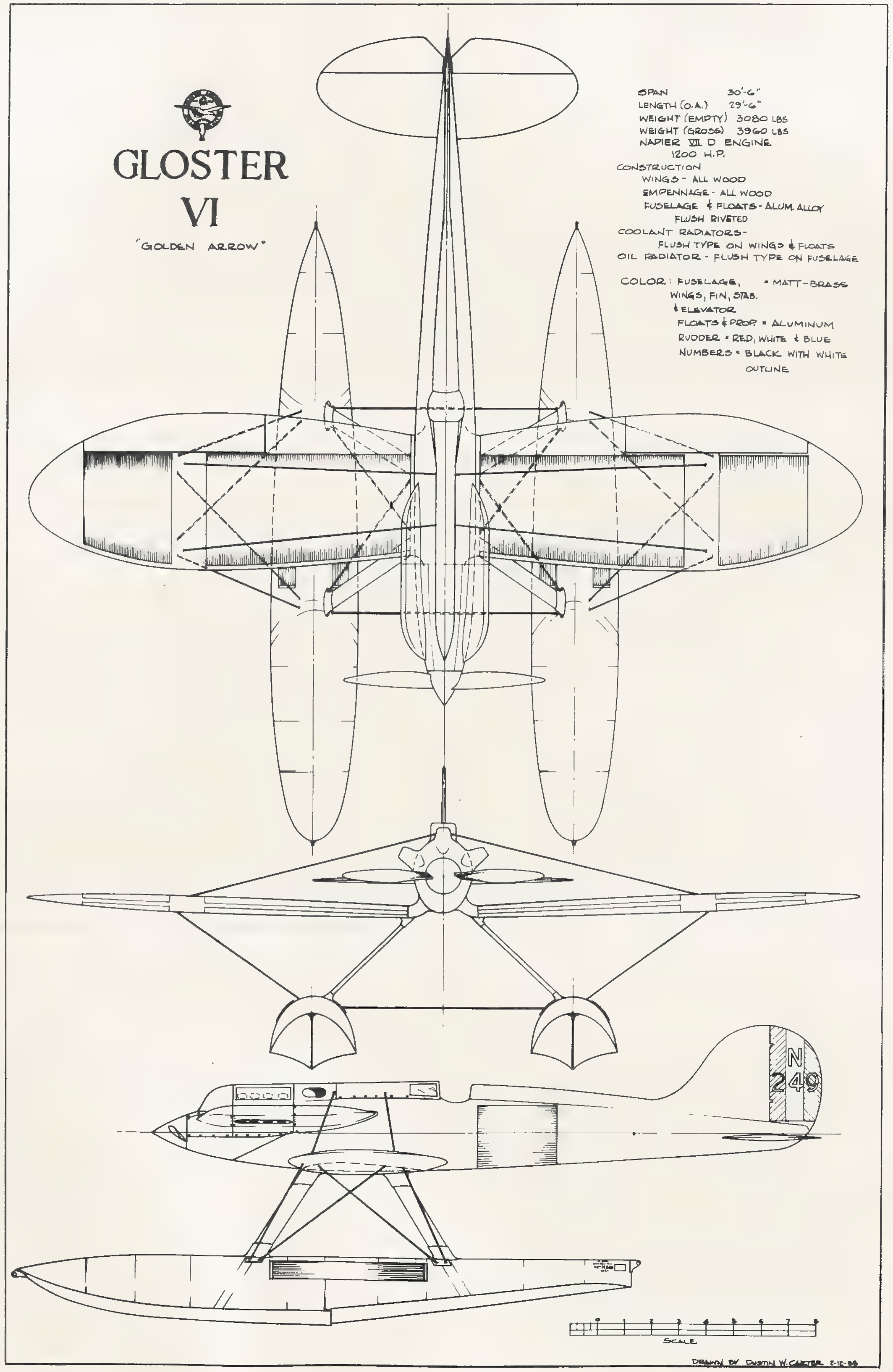
Kinkead, first off in the graceful Gloster IVB, was followed by De Bernardi, Webster, Gauzetti, Worsley, and Ferrarin. Scarcely had the last man taken-off, when trouble started among the Italian ships. The Fiat engines had given trouble in previous test flights, and it was felt that detonation was the cause. This proved to be the case as Ferrarin was forced to land almost immediately after becoming airborne. De Barnardi, after covering only one lap, was forced to do likewise. On the fifth lap, Kinkead, who had accomplished the remarkable speed of 289 mph on his third lap, retired when his engine began to vibrate badly. As the Gloster's floats touched the waters of San Andrea, it marked the end of the biplane as a high performance aircraft.

The race then settled down to a battle between the lone Macchi M-52 and the two Supermarine S-5's. Gauzetti, Italy's only hope, went out of the race in his seventh lap because of engine failure. Webster, with the geared Napier engine, slowly forged ahead of his only rival, Worsley. Both planes performed flawlessly, and Webster emerged victorious with an average speed of 281.656 mph; Worsley averaged 272.96 mph. Thus, the trophy was returned to England, and the proved superiority of the British planes and engines was the cause for much rejoicing. National backing by the British government had produced a team of expertly designed aircraft and superbly trained men which gained the admiration of the entire aviation world. The scope of this contest was so worldwide and so directly affected national pride, that the Schneider Trophy Contests instantly became the "Blue Riband" events of international aviation competitions.

THE ELEVENTH SCHNEIDER TROPHY CONTEST was organized by the Royal Aero Club of England for the 7th of September 1929 at Ryde, on the Isle of Wight. Again the U.S. had withdrawn its only entrant, a Mercury racer built by the Naval Aircraft Factory for Lt. Al Williams. Powered by a new 24-cylinder Packard engine, this mid-wing racer had continuously given trouble with its float design. (These troubles were both aerodynamic and hydrodynamic.) Williams reluctantly announced

Supermarine S-5, with Webster up, won 1927 event





his decision not to enter the plane.

Italy again appeared with a whole new stable of racers, ranging from three new Macchi M-67's, powered by new Isotta-Fraschini 1400 hp engines, to an unusual Savoia Marchetti S-65 tractor-pusher design with two Isotta-Fraschini engines of 1000 hp each. The Italians also had a diminuitive Fiat C-29 powered by a 1000 hp Fiat ASV engine, and a weary and scarred Macchi M-52 that was a veteran of the 1927 Schneider Contest. This reliable ship had been dubbed "The Moor of Venice" by her affectionate crew and had undergone over 400 hours of flying at Lake Garda in Italy as a training plane for the Italian team. She was still to have her day as events immediately disclosed.

For the 1929 Schneider Contests England had three sure-fire combinations to guarantee a winning team. First, the Air Ministry had paired R. J. Mitchell of Supermarine with Rolls-Royce to produce two new racers known as S-6's. These craft, while generally similar to the 1927 S-5's, were larger to accommodate the increased size and power of the supercharged Rolls-Royce "R" engines that were especially designed and built for them. The second British combination joined H. P. Folland of Gloster with Napier. This merger produced one of the most attractive of all Schneider racers ever built, the Gloster VI "Golden Arrow." Third, the Royal Air Force had carried on a training program with a group of selected pilots from both branches of the services. Called the "High Speed Flight," this group, under the able command of Capt. A. H. Orlebar, had undergone two years of extensive flying at Calshot in the S-5's and Gloster IV aircraft to prepare them for this important international meet. For weeks preceding Sept. 7th, this team flight-tested both the Gloster VI and the Supermarine S-6 racers. They found that the Glosters, while docile and well behaved, suffered from engine troubles that were believed to be caused by poor induction system recovery. In spite of this engine difficulty, Flt. Lt. Stainforth flew Gloster number N-249 four passes over a 3 km course on Sept. 10th to establish a world's speed record of 336.23 mph. Thus, the beautiful "Golden Arrow" was not denied some glory of the occasion. Later, the same day however, Sqd. Ldr. Orlebar, in the S-6 N-247, averaged 355.8 mph on the same course. It is significant that for an advantage of 750 horsepower, he exceeded the Gloster's mark by only 19 mph. This is a remarkable tribute to the aerodynamic cleanliness of Folland's design.

Flt. Lt. H. Waghorn	(England) Supermarine S-6 Rolls-Royce "R" 1950 hp.	Racing No. 2
Warrant-Officer T. Dal Molin	(Italy) Macchi M-52 Fiat AS-3 1030 hp.	Racing No. 4
Flt. Lt. D'Arcy Greig	(England) Supermarine S-5 Napier "Lion" VIIG 875 hp.	Racing No. 5
Lt. R. Cadringher	(Italy) Macchi M-67 Isotta-Fraschini 1400 hp.	Racing No. 7
Flying Officer Atcherley	(England) Supermarine S-6 Rolls-Royce "R" 1950 hp.	Racing No. 8
Lt. G. Monti	(Italy) Macchi M-67 Isotta-Fraschini 1400 hp.	Racing No. 10

Chart 2

The navigability trials were held on Friday, Sept. 6th. Three Italian entrants, two Macchi M-67's and the plucky Macchi M-52, were successful. For the British, both Supermarine S-6's qualified and one of the S-5's of 1927 was also entered, since each team was entitled to three planes. The final entrants for the contest appear in chart 2.

Promptly at 2 p.m., on Saturday, Sept. 7th, the boom of the starting gun on the timer boat signaled the start of the event, watched by an estimated million spectators. Waghorn was first away. Excitement grew as he sped down the stretch from the West Cowes marker boat and roared by the Ryde pier. He had averaged 324 mph on the first lap, an impressive beginning. Dal Molin was next in "The Moor of Venice" and he screamed by the starting line in an exquisite takeoff. Rapidly the rest of the planes took off and the crowd had the momentary spectacle of seeing six of the world's fastest aircraft flying together. Events began to happen at this point in quick order. First, Cadringher retired after suffering from fumes in the cockpit on his second lap. At this same moment, Atcherley, who had lost his goggles on takeoff, was forced to resort to oblique navigation from within the confines of the windscreen. This so completely blinded him on the first turn at Seaview that he was disqualified for cutting inside the marker boat. Unaware of this, he continued the race with superb flying to win both the 50 km and 100 km speed records.

In the meantime Monti, who barely completed one lap, had a water line break and was severely scalded. He made an abrupt landing without damage to the aircraft, under conditions which could easily have been fatal. The contest then resolved itself around Waghorn who, lap by lap, continued to increase his speed. He easily outdistanced Dal Molin and Greig, and won at an average speed of 328.63 mph. Dal Molin, flying the ubiquous M-52, was second with as fine a display of consistent flying as the Schneider races ever produced. He averaged 284.44 mph. D'Arcy Greig was third in the S-5 at 282.11 mph. As a comparison, Atcheley's average speed was 325.54, however he has been disqualified, as previously mentioned.

Thus ended what was perhaps the most successful of all Schneider Contests to date. The speed of 300 mph had been reached and generously exceeded, and the trophy remained in the possession of Great Britain. With one more win by British pilots, the trophy would forever rest with England. The international prestige of England's aeronautical industry at this point was at a pinnacle seldom atained since. Italy, defeated, but undaunted by the fortunes of the contest, was still a formidable opponent. General Balbo, Italian Undersecretary for Air, announced at an informal banquet he would be back in 1931 to display the capabilities of his team. This was an indication that the 1931 contest would likely produce some outstanding new designs and some new speed figures, possibly in the 400 mph range. With knowledge of such designs as the revolutionary Piaggio Pc-7, which dispensed with drag producing floats in favor of hydro-skis, it was hard to ignore the abilities of Italian aircraft designers. They were exploring new fields of high speed flight, a stimulus of the Schneider Trophy Contests, a reward even to the vanquished. *(To be continued)*

Waghorn flew Supermarine S-6 to win 1929 Schneider Cup

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Institute of the Aeronautical Sciences

Aeronautica

VOLUME 7
NUMBER 2

APRIL-JUNE
1955

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Official Publication for Historical Associates

Volume 7

CONTENTS

Number 2

FEATURES

Entire issue devoted to the career of the late Admiral J. H. Towers, USN
Scale drawing of Navy Curtiss A-1 5

DEPARTMENTS

Courtney's Corner 2

STAFF

EDITOR—George R. Lawlor, ASSOCIATE EDITOR—Warren M. Bodie,
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In Appreciation

This special documentary issue of AERONAUTICA represents considerable research on the part of the editors, of course, but without the wonderful help and cooperation of outside sources it would have been impossible. For their prompt assistance, sometimes involving considerable trouble, we especially thank

R. W. Post, Commander, USN, Technical Data Division USN, Bureau of Aeronautics;
Wade DeWeese, Captain, USN, United States Naval Academy;
Robert C. Strobell, Associate Curator, National Air Museum, Smithsonian Institution;
Year, Inc., Publishers of *Pictorial History of Flight.*

We sincerely hope that our effort is worthy of theirs, and in some small way does honor to the memory of Admiral Towers.

COURTNEY'S CORNER

BOMBS AWAY!

By
Frank T. Courtney

It is interesting to speculate what might have happened if the atom bomb of World War II had been available during World War I. Presumably it would have required a suicide crew to deliver it because no bomber capable of lifting it could fly high enough or fast enough to get out of the way of the blast.

The standard air bomb at the start of the first World War was a ferocious twenty-pounder, hung on a sort of grid attached to the airplane, and released by pulling a wire in the cockpit. It was aimed by a combination of practice and hope on the part of the pilot, so that from 500 feet you could figure on hitting a town if the town wasn't too small.

A larger bomb achieved amateur production in the Royal Naval Air Service by the fitting of home-made fins to six-inch artillery shells. Hand grenades were frequently used; they were hung anywhere handy around the cockpit and had to be handled gingerly, especially with one hand on the stick, as they went off on contact after the pin was pulled. The famous *flechettes*, steel arrows dropped out of tin boxes by releasing a hinged lid, were expected to be very murderous and probably were in the unlikely event of your hitting anyone with them.

Most earlier bombs had to be armed before flight, so you were out of luck in the event of a take-off crash. In No. 3 Squadron we lost Captain Chohnondeley and ten men when a French melinite bomb went off whilst being fixed on the rack. We also lost Corbett-Wilson when his Morane blew apart, apparently as the result of hitting part of his airplane when he threw a grenade.

My own first bombing effort was to try and drop two 20-pound Hale bombs (all I could carry) on Don railroad junction near La Bassée. One blew up a hayrick about quarter of a mile from the target; what happened to the other I never knew. The last of my earlier bombing attempts was an effort to bring down an observation balloon by dropping *flechettes* on it and throwing hand grenades at it. The balloon didn't seem to mind very much, but I wound up in the hospital having been shot down by a Fokker which concentrated on me whilst I was concentrating on the yellow gas-bag.

Towards the end of 1916, really monstrous bombs of 250 pounds began to come out, and later the Independent Air Force under Trenchard did a good job of distributing thousands of these over German cities. The material damage probably wasn't much by later standards, but the moral effect and stoppages of work seem to have been considerable because, apparently, nobody likes being bombed, even by little bombs.

Admiral John H. Towers, USN
1885-1955

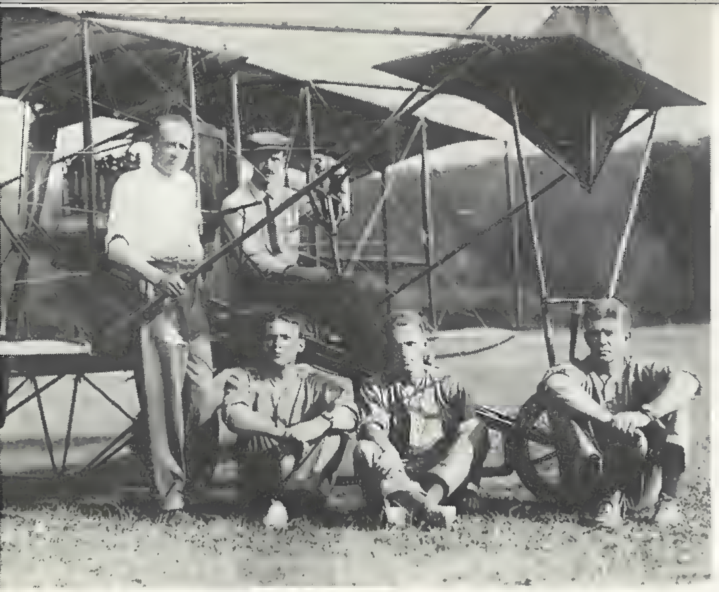
Born in Rome, Georgia, son of William M. and Mary N. Towers. Appointed to U. S. Naval Academy 1902, graduated 1906. Fire Control Officer and Spotter, *USS Michigan*, 1910, assigned to aviation duty in June 1911. Aero Club of America Pilot No. 62, Naval Aviator No. 3. Flying duties at Annapolis and North Island, San Diego, 1911-12; Executive Officer, Pensacola Naval Air Station, 1914. Assistant Director of Naval Aviation 1918. Commanded Atlantic flight of NC boats 1919. In 1921 Executive Officer, Pensacola; 1926 Executive Officer, *USS Langley*, assumed command 1927. Chief of Staff, Aircraft, Battle Force 1931, Commanding Officer, *USS Saratoga* 1937, Assistant Chief BuAer 1938. Chief, BuAer 1939-1942. Commander Air Force, U. S. Pacific Fleet 1942, Commander, Fifth Fleet 1945. In 1946, Commander in Chief, Pacific Fleet and Pacific Ocean Areas. 1947 Chairman, General Board, Navy Department; Retired Dec. 1, 1947. Died April 30, 1955.

EDITORIAL

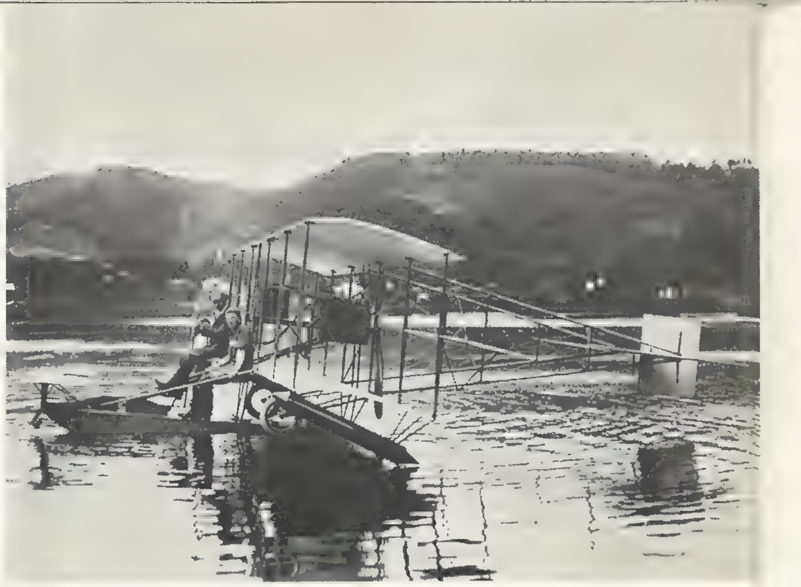
"A shy, flaxen-haired son of the Sunny South" was how the Naval Academy's annual described Midshipman John H. Towers. Graduated on February 12, 1906, he still had to serve two years at sea before being commissioned an Ensign. But this "shy son of the South" was to become one of the immortals of aviation. And his story would be the story of Naval air power.

Aviation can boast of many heroes; to name a few would slight many. But none worked more steadily and conscientiously than John Towers. Day after day he flew the old box kites, plugged leaky radiators, rewired magnetos, helped replace a piston or grind a crankshaft. Day after day, while others were being feted as heroes of the sky, Towers quietly helped develop some of the most important features that made the airplane a practical form of transportation and later a powerful weapon. Even when he accomplished some "first," or set a new record, it was simply in line of duty.

Of course Towers eventually had his day of glory as Commander of the first trans-Atlantic flight, but it was his calm courage that brought the NC-3 to safety when it was forced down at sea. And later it was his sound judgement and experience that helped bring the Japanese Empire to its knees. To John Towers, dedicated, steady, a successful man, we devote this issue of AERONAUTICA.



FLIGHT TRAINING BEGAN for Lt. John H. Towers in July, 1911, at Hammondsport, N. Y., with capable Glenn H. Curtiss as instructor. He had reported for duty on June 27, joining Lt. T. G. Ellyson who became Navy pilot No. 1 a few days later. Shown with Curtiss "E" trainer are (l. to r.) Lt. J. W. McClaskey, Curtiss, Lt. P. W. Beck, Towers, and Ellyson. *Photo—Smithsonian*



FIRST NAVY AIRPLANE, the Curtiss A-1 seaplane, often referred to as the *Triad*, made its initial flight on July 1, 1911. The retractable wheels were installed on July 8, and two days later Curtiss made a flight from land, retracted the wheels in the air, and landed on Lake Keuka. Lt. Towers first piloted the A-1 on July 6. Ellyson shown here with Curtiss. *Photo—Bodie*

AB INITIO: THE STORY OF ADMIRAL JOHN HENRY TOWERS

AB INITIO. To tell the story of John Henry Towers from the beginning of his naval career is to tell the story of Naval Aviation. Limitations of time and space do not permit the full record here, but through word and picture we hope to outline the career of this remarkable man who devoted his life to America and the United States Navy.

On June 27, 1911, Lt. Towers reported for duty at Hammondsport, N. Y., to conduct experiments on the Navy's first airplane, the Curtiss A-1. During the following months he worked closely with Lt. T. G. Ellyson, the first Navy pilot, and G. H. Curtiss. Towers made his qualification flights on Sept. 14, and was awarded Aero Club of America license No. 62. The first naval aviation organization began operations in that same month at Greenbury Point, near Annapolis, Md., with three airplanes.

During 1912, he did practically all of the experimental *hydroaeroplane* flying for Glenn Curtiss at North Island, which eventually became the location of the San Diego Naval Air Station. On Oct. 6, 1912, he established a new U. S. solo duration record by flying continuously for 6 hrs. 10 min. 35 secs. in a Curtiss *hydro*. Ellyson and Towers made many proving flights in the A-1, including a flight of 112 miles in 122 minutes on October 25, 1912.

In June 1913, Lt. Towers narrowly escaped death while flying with Ens. W. D. Billingsley in a Navy-Wright airplane. It capsized in the air, and the pilot fell to his death since safety belts had not been adopted. Towers held on to a strut, falling 1600 feet with the airplane. Landing in the water, he was quickly rescued, although sustaining serious injuries. This incident is said to have led to the first adoption of safety belts as standard equipment.

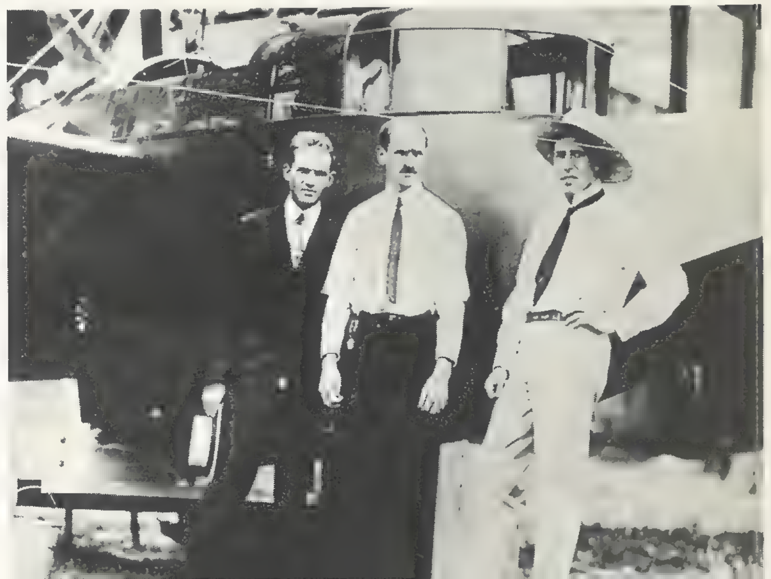
He was associated with Curtiss and Lt. J. C. Porte during 1914 in developing the trans-Atlantic flying boat *America*. This was the first large flying boat in the world, and was the basis for all large patrol boat development. The famous H-12, F-5L, and H-16 types stemmed directly from this design.

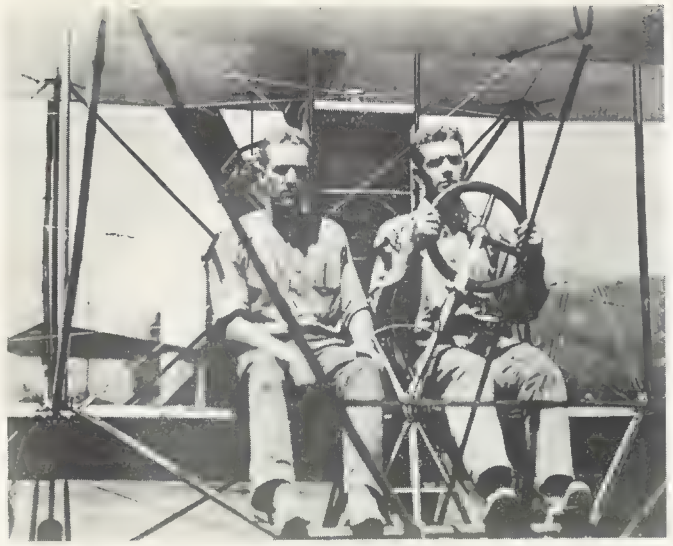
Following a tour of duty as Assistant to the U. S. Naval Attache, London, he was assigned to the Office of the Chief of Naval Operations as head of

(continued on page 8)

$25,000 APPROPRIATION paid for first three airplanes ordered by the Navy. Curtiss received orders for the A-1 *hydroaeroplane* and A-2 landplane. Constant experimentation changed the A-2 to a *hydro* by 1912 it was first Navy flying boat. *Photo—Bodie*

GIANT FLYING BOAT, the Curtiss *America*, was built to span the Atlantic. At Curtiss' request, Lt. Towers went to Hammondsport, N.Y. to test the plane. Shown with Towers and Curtiss is Lt. John Cyril Porte of the Royal Navy, who was to make flight. *Photo—Smithsonian*





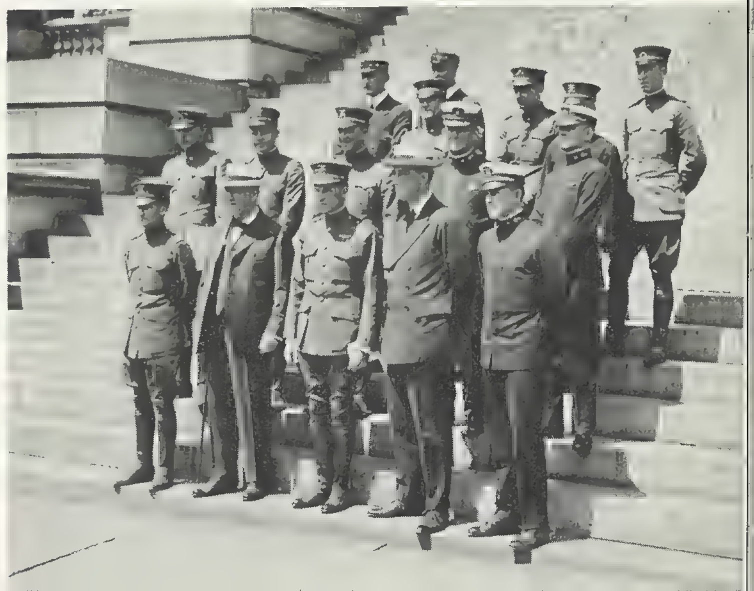
RIGHT AND LEFT HANDS of naval aviation in 1911 were Lts. Towers (l.) and Ellyson, shown demonstrating "throw-over" dual flight control developed jointly by them and Glenn Curtiss. This modification of the A-1 permitted control to be passed to either pilot in flight. Towers was officially designated Navy pilot No. 3, having qualified Sept. 14, 1911. *Photo—U.S. Navy*

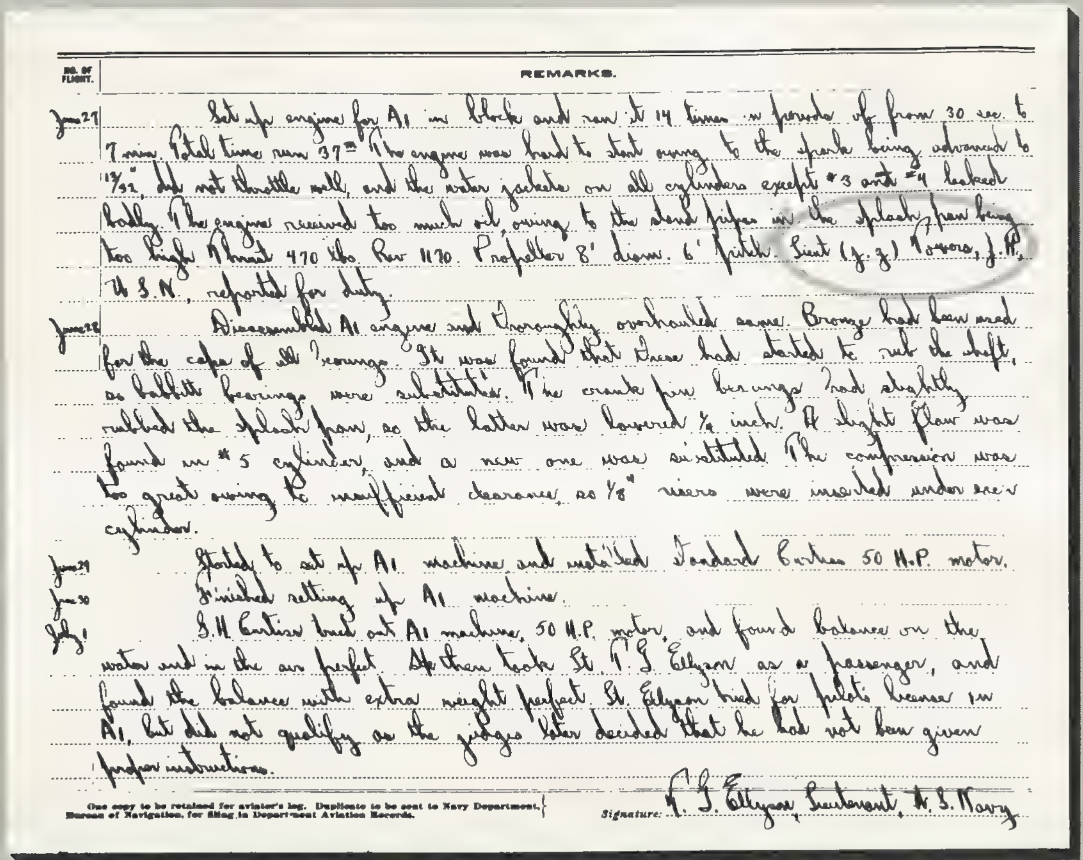
ON THE STEP, Curtiss-built H-12 takes off for patrol over the Atlantic. Developed from the *America* boat, they were produced in quantity in 1917. *Photo—Bodie*

FAMED GIANT, the Navy-Curtiss NC-4 is shown undergoing final adjustment at Rockaway, L. I., prior to departure for Lisbon and immortality. Towers was in command of flagship NC-3 and flight. *Photo— Bodie*

PRINCIPAL CENTER of naval aviation in 1914 was an abandoned Navy yard at Pensacola, Florida. Lt. Towers, serving as the only naval aviator on Board of Aeronautics in Oct. 1913, helped choose site. This view shows Pensacola as it looked in 1914. *Photo—U.S. Navy*

HEROES OF THE DAY, NC boat crews were welcomed by Navy Secretary Daniels and Asst. Sec. F. D. Roosevelt. Pictured on steps of Navy Department Bldg., group included LCdr. Read, Daniels, Towers, F.D.R., LCdr. Bellinger, Cdr. Richardson. *Photo— U. S. Navy*

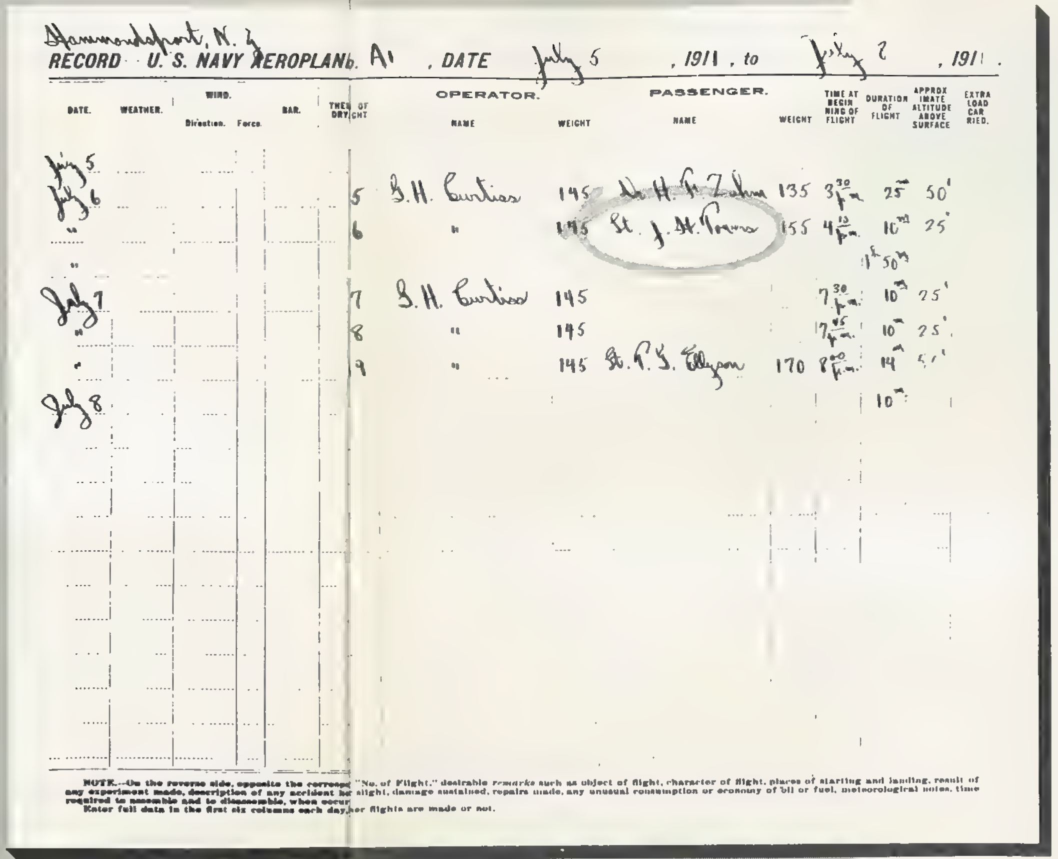




NO. OF FLIGHT.	REMARKS.
June 27	Set up engine for A1 in block and ran it 14 times in periods of from 30 sec. to 7 min. Total time run 37m. The engine was hard to start owing to the spark being advanced to 13/32", did not throttle well, and the water jackets on all cylinders except #3 and #4 leaked badly. The engine received too much oil, owing to the stand pipes in the splash pan being too high. Thrust 470 lbs. Rev 1170. Propeller 8' diam. 6' pitch. Lieut (j.g.) Towers, J.H., U.S.N., reported for duty.
June 28	Disassembled A1 engine and thoroughly overhauled same. Bronze had been used for the caps of all bearings. It was found that these had started to rub the shaft, so babbitt bearings were substituted. The crank pin bearings had slightly rubbed the splash pan, so the latter was lowered 1/4 inch. A slight flaw was found in #5 cylinder, and a new one was substituted. The compression was too great owing to insufficient clearance, so 1/8" risers were inserted under each cylinder.
June 29	Started to set up A1 machine and installed standard Curtiss 50 H.P. motor.
June 30	Finished setting up A1 machine.
July 1	S.H. Curtiss tried out A1 machine, 50 H.P. motor, and found balance on the water and in the air perfect. He then took Lt. T. G. Ellyson as a passenger, and found the balance with extra weight perfect. Lt. Ellyson tried for pilot's license in A1, but did not qualify as the judges later decided that he had not been given proper instructions.

One copy to be retained for aviator's log. Duplicate to be sent to Navy Department, Bureau of Navigation, for filing in Department Aviation Records.

Signature: T. G. Ellyson, Lieutenant, U.S. Navy.

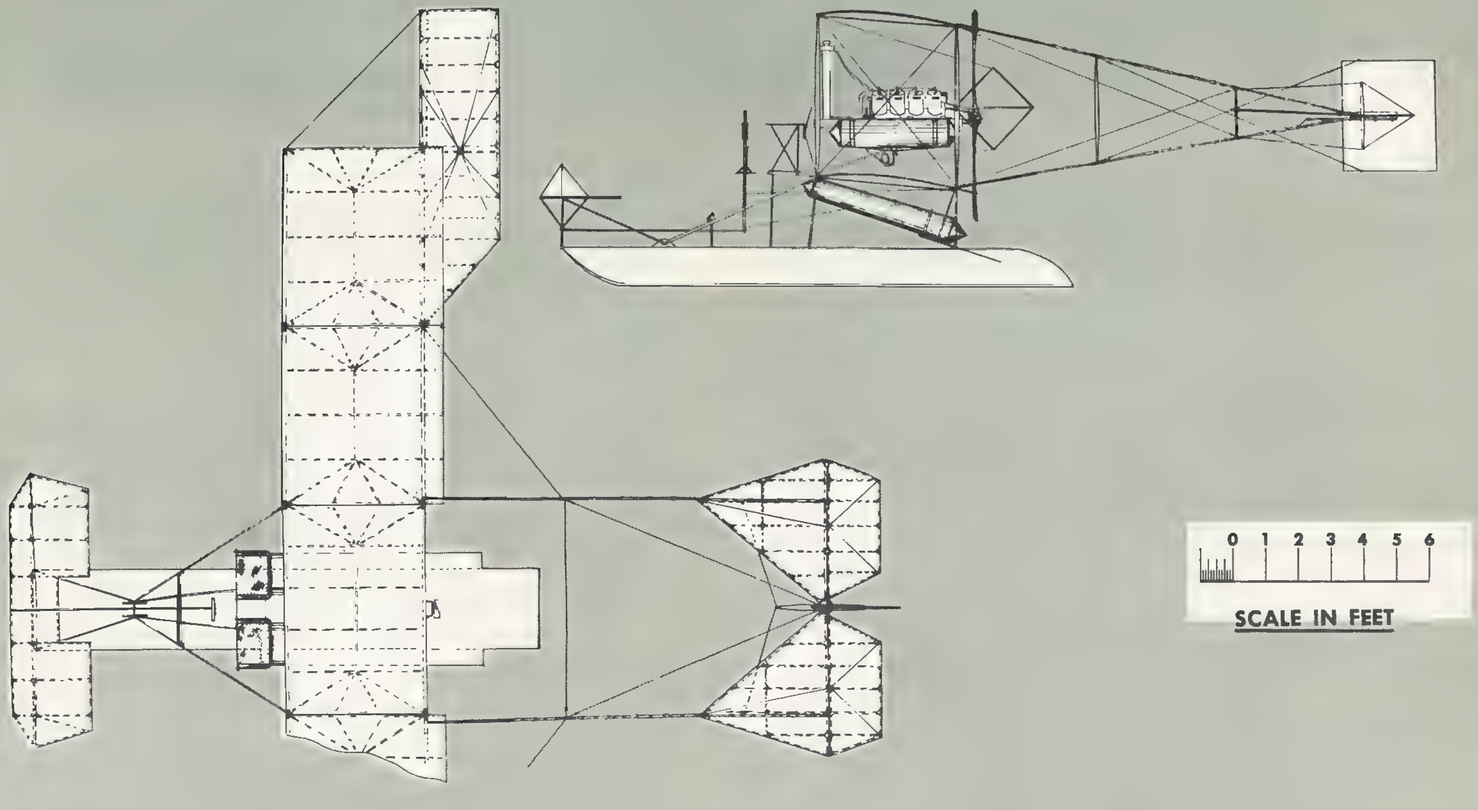


Hammondsport, N. Y.
RECORD U. S. NAVY AEROPLANE A1, DATE July 5, 1911, to July 8, 1911.

DATE.	WEATHER.	WIND. Direction.	WIND. Force.	BAR.	[illegible]	OPERATOR. NAME	OPERATOR. WEIGHT	PASSENGER. NAME	PASSENGER. WEIGHT	TIME AT BEGINNING OF FLIGHT	DURATION OF FLIGHT	APPROXIMATE ALTITUDE ABOVE SURFACE	EXTRA LOAD CARRIED.
July 5													
July 6					5	S.H. Curtiss	145	[illegible]	135	3^{30} p.m.	25m	50'	
"					6	"	145	Lt. J. H. Towers	155	4^{15} p.m.	10m	25'	
"											1h 50m		
July 7					7	S.H. Curtiss	145			7^{30} p.m.	10m	25'	
"					8	"	145			7^{45} p.m.	10m	25'	
"					9	"	145	Lt. T. G. Ellyson	170	8^{00} p.m.	14m	[illegible]	
July 8											10m		

NOTE.—On the reverse side, opposite the corresp "No. of Flight," desirable *remarks* such as object of flight, character of flight, places of starting and landing, result of any experiment made, description of any accident he flight, damage sustained, repairs made, any unusual consumption or economy of oil or fuel, meteorological notes, time required to assemble and to disassemble, when occur
Enter full data in the first six columns each day, her flights are made or not.

EXCERPTS FROM THE OFFICIAL LOG OF THE CURTISS *HYDROAEROPLANE* NAVY NO. A-1



CURTISS *HYDROAEROPLANE*

NAVY A–1

DISASTER STRUCK the Navy dirigible *Shenandoah* when she was caught in a violent storm, Sept. 3, 1925, over Byesville, O., killing 14 men. The Navy Department ordered an immediate investigation; Commander Towers, then on duty in Washington, was assigned to the court of inquiry. One of the witnesses (below) was famous "Billy" Mitchell. *Photo—Library of Congress*

JAUNTY BOEING F4B-2 fighter typified the aviation developments of the peacetime Navy. Capable of about 176 mph, these little pursuits in bright paint and squadron markings were the finest carrier fighters (and Navy pilots best trained) of time. *Photo—Bodie*

TYPICAL COMMANDS held by Towers included the *Langley* (lower l.) in 1927, and San Diego Naval Air Station (bottom) in 1934. His action in combating fires on the *Langley* was commended. Representative of Battle Force aircraft in 1920-30 era was Martin MT bomber; Towers served as Chief of Staff to Commander Aircraft, Battle Force, 1931 and 1936. *Photo—Bodie*

STRIKING FORCE of *USS Saratoga* in early 1938, these Douglas TBD-1 bombers were among World's best at that time. Towers served as Commanding Officer of the CV-3 *(Saratoga)* from June 1937 to July 1938. (Four years later, during battle of Midway Island, the obsolete TBDs suffered staggering losses.) Rear Admiral Towers became Chief, BuAer, 1939. *Photo—USN*

(continued from page 5)

Naval Aviation. Serving as aviation expert on the General Board, he fought hard for an active naval air force.

For his part in directing the ocean spanning flight of the NC boats, Towers, by then a Commander, was awarded the Navy Cross. During the flight, dense fog forced his flagship, the NC-3, to land at sea. The heroic crew taxied 205 miles in 52 hours, arriving in the Azores with severe damage on May 20, 1919. Success of the venture was assured when NC-4 arrived at Lisbon on May 27.

On Jan. 4, 1927, Cdr. Towers was placed in command of the Navy's first aircraft carrier, *USS Langley*. Later in the year he directed a successful action to suppress a fire aboard his ship, and was commended for his part in preventing a catastrophe. He became Chief of Staff to the Commander Aircraft, Battle Force, in 1931, and was placed in command of the San Diego Naval Air Station in 1934. He reported as Commanding Officer of the carrier *USS Saratoga* (CV-3) on June 9, 1937.

With the rank of Rear Admiral, he was appointed Chief of the Bureau of Aeronautics on June 1, 1939, where he organized the Navy's mass production program for aircraft. On Oct. 6, 1942, he assumed command of the Air Force, Pacific Fleet, with the rank of Vice Admiral, where he directed operations of the carrier fleet as well as land-based Navy and Marine Corps aviation. His command was extended to the entire fleet, as well as U. S. Army commands, when he became Deputy Commander-in-Chief, Pacific Fleet and Pacific Ocean Areas, helping determine overall strategy. Hoisting his flag on the carrier *Bennington*, with the rank of Admiral, Towers assumed his final command on Feb. 1, 1946, as Commander-in-Chief, Pacific Fleet and Pacific Ocean Areas.

PLUNGED INTO BATTLE by the Japanese attack on Pearl Harbor, the Navy suffered crippling losses in the first months of war. America, rudely awakened to the threat of air power, learned the lesson well. Coral Sea and Midway Island were major victories for aviation. As Chief of the Bureau of Aeronautics, Adm. Towers organized Navy's production program. *Photo—USN*

CHECKMATE for Japanese air power was typified by the Grumman *Hellcat*. In June 1940, naval aviation had 1,741 aircraft; by V-J Day there were 41,272 airplanes in service. The carrier force grew from eight ships in Dec. 1941 to 99 by the end of the war. Under successive commands of Admirals Fitch and Towers, Air Force, Pacific Fleet, became potent force. *Photo–USN*

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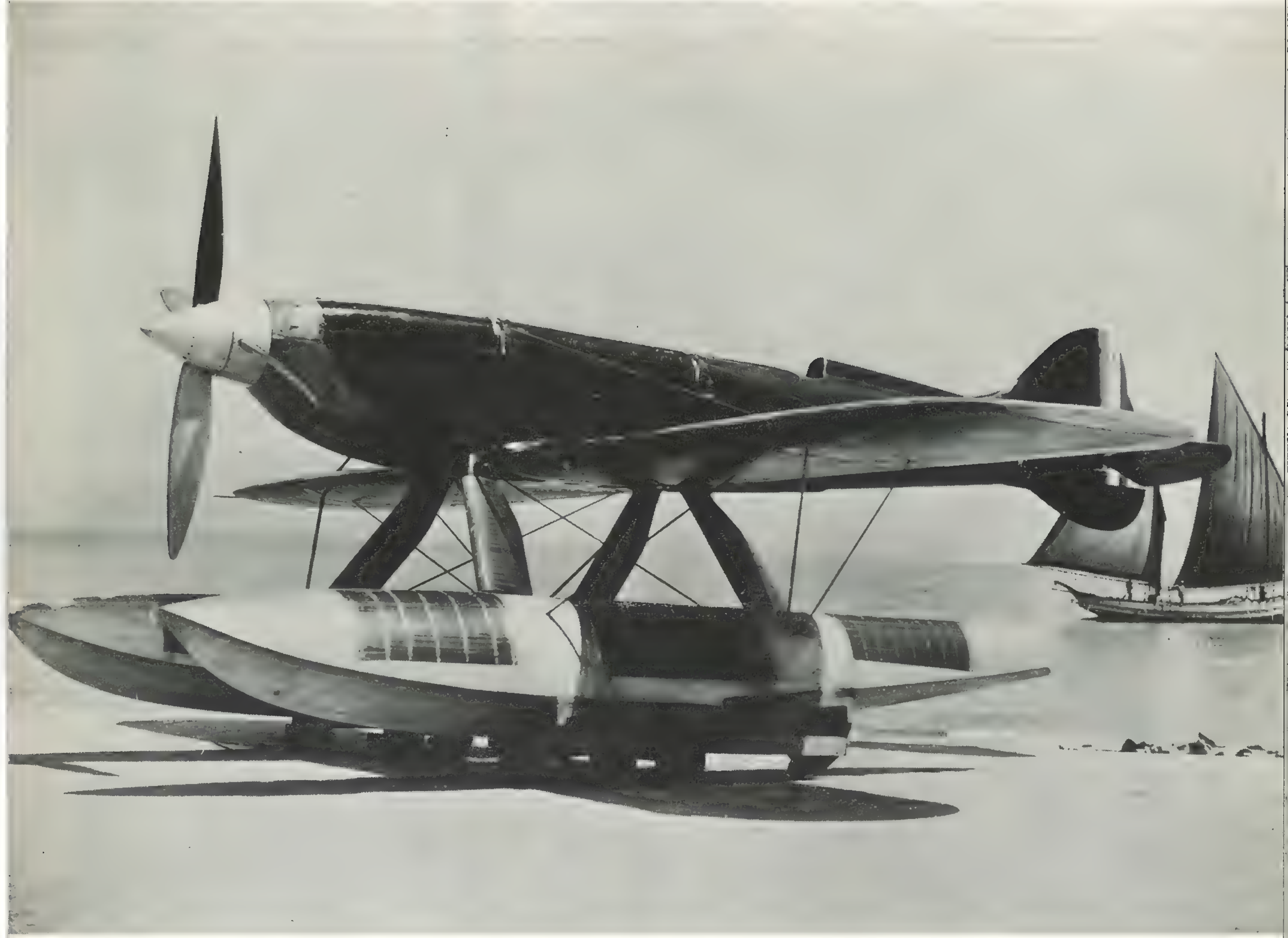

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1955

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CONTENTS

FEATURES

Cavalcade of Aviation 2
The Birth of Speed, Part 5 (Conclusion) 4
Macchi M.C. 72 three-view 7

STAFF

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AVIATION CAVALCADE

TRACES HISTORY OF FLIGHT

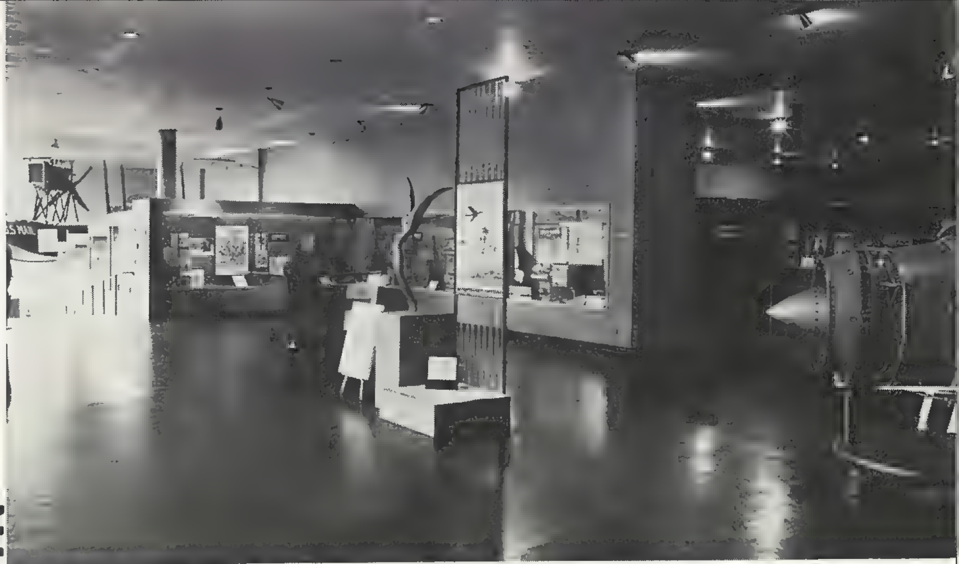
Seattle Historical Associates present first exhibit in Pacific Northwest to portray progress of Flight—from Wrights to jets.

The Cavalcade of Aviation, presented by the Historical Associates of the Seattle Section in that city's Museum of History and Industry, has proven so popular that its original five-month run has been extended for thirty days.

The exhibit was originally proposed by Mrs. Elizabeth Sutton Gustison, of the Seattle Historical Society and Director of the museum. The idea was quickly approved by Institute Headquarters and organization turned over to Peter M. Bowers, Chairman of the Northwest Historical Associates.

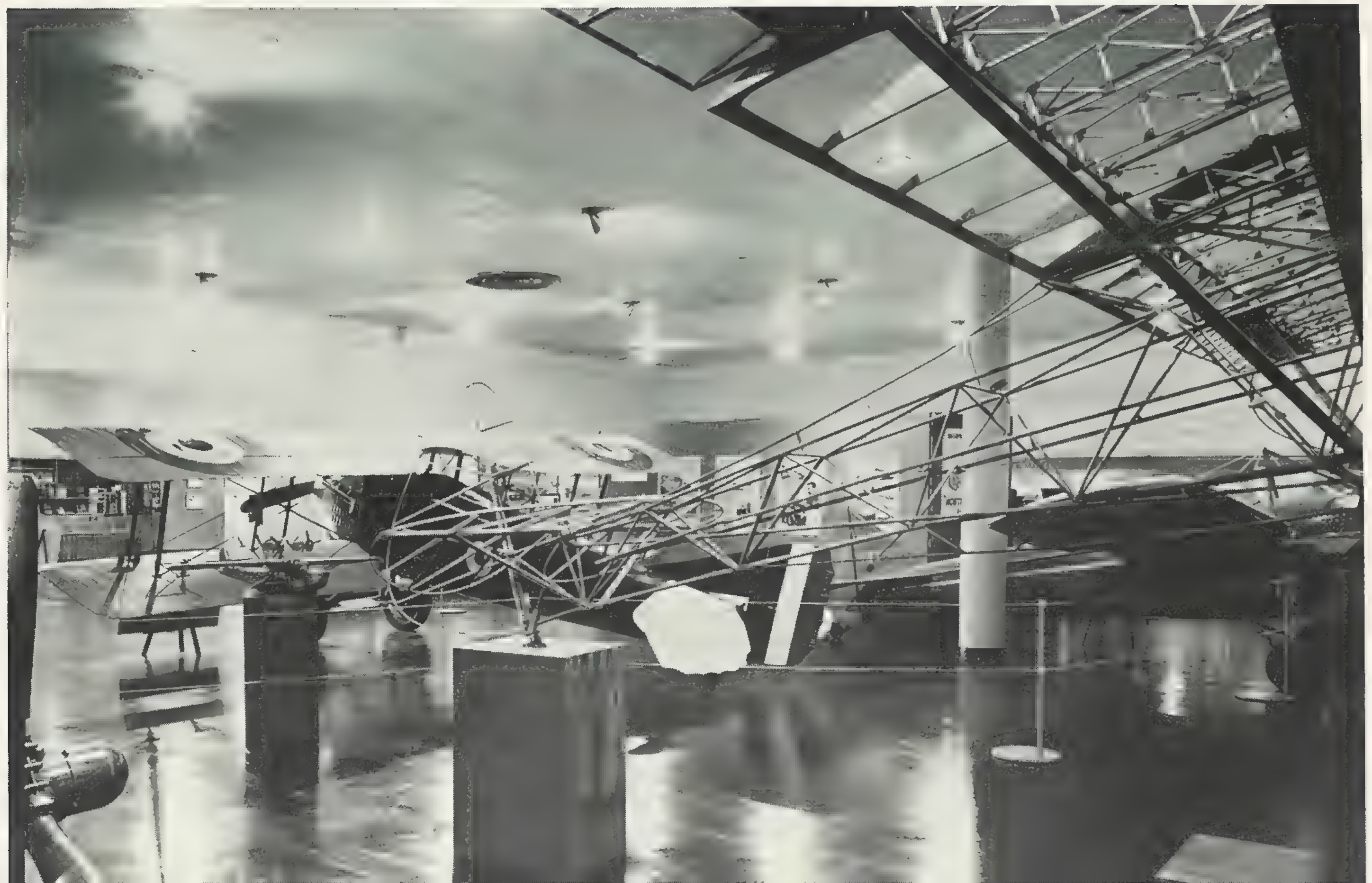
The Cavalcade opened on Sunday, June 5, to the accompanying fanfare of a U. S. Navy band and soon was breaking all museum attendance records. The displays, well organized to be educational and informative, were drawn from several private collections, the University of Washington, the Edison Technical Institute, the Navy and Air Force, and virtually the entire aircraft industry. Of the latter, the Boeing Airplane Company should be singled out for their photographic assistance, artistic planning, and transportation of heavy items. The Seattle Park Department set up the displays.

The success of the exhibit has been a great credit to the Seattle Section, their Historical group, Boeing, and the Seattle Historical Society.



IMPRESSIVE ENTRANCE to Cavalcade (above) featured early jet engine, contemporary sculpture symbolizing Flight. Down ramp (below) were seen various technical exhibits and recently restored Boeing B-1 flying boat, which flew one of first official airmail routes, Seattle to Vancouver, B. C. *Photos—IAS*

ESPECIALLY POPULAR were the model displays, one seen below, and several full-size aircraft (left). Latter, seen behind sailplane skeleton, included famous Buhl Bull Pup and French World War I SPAD fighter in mint condition.



the birth of SPEED

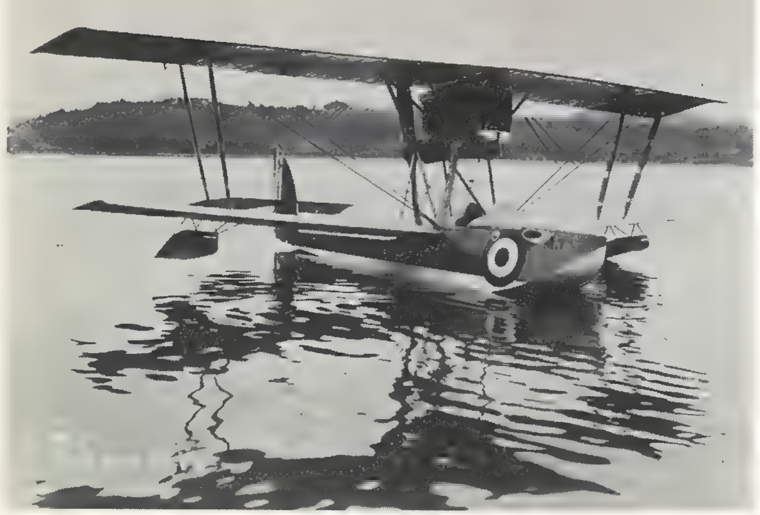
Part Five (Conclusion)

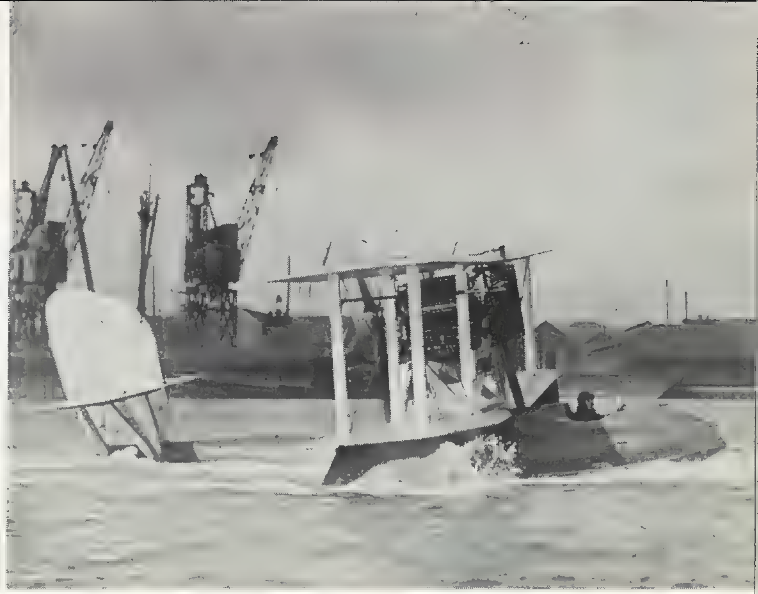
BY JACK D. CANARY

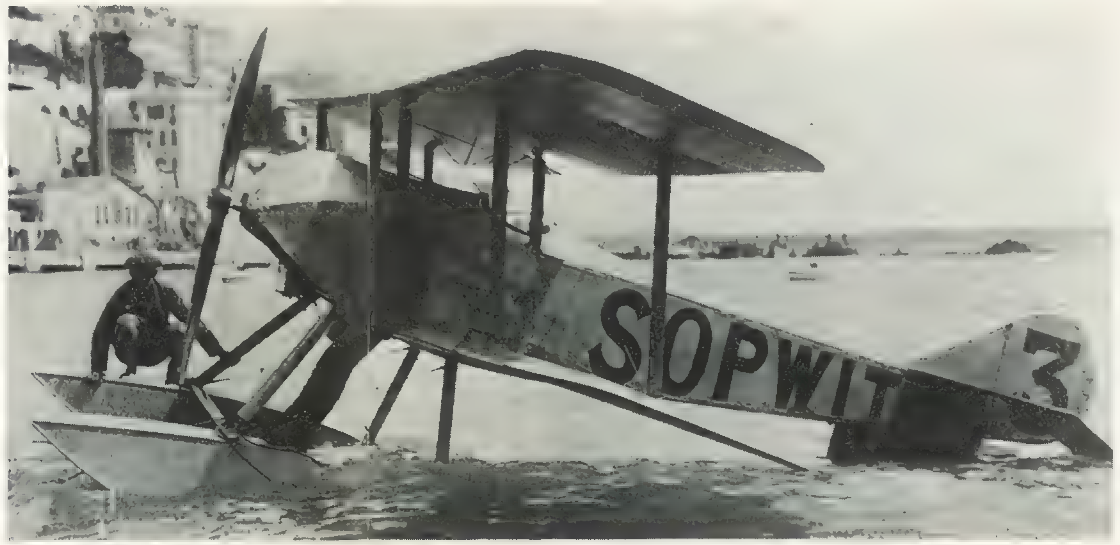
After the 1929 Schneider Trophy Contest had been recapped, the British government was in somewhat of a predicament. They had fostered in both 1927 and 1929 a high speed flight team made up of selected pilots from both the Fleet and the Air Force and had equipped this team with the finest racing seaplanes in the world. In both the 1927 and 1929 contest they had decisively won to the plaudits of the entire aviation world. Surely British prestige in the aviation industry was at its highest due to the proof of technical excellence that winning the Schneider Contests furnished. On the other hand the expense of continued research and training to produce another top flight team for the 1931 contest was considered too great what with general world business conditions prostrate after the 1929 recessions. This was a hard decision to make, whether to continue development for a contest in 1931 and risk the criticism of certain economy minded government officials, or abandon support of the high speed flight group at Calshot with permanent possession of the coveted Schneider Trophy in sight. Through 1930 this condition prevailed in the face of announcements by both France and Italy of a determined effort for the 1931 contest. As the year 1931 commenced, pressure from the aviation industry forced the Air Ministry to reluctantly announce that no support for the contest could come from them. Immediately, the patriotic Lady Houston offered £100,000 to cover the expenses of the development of new machines for the 1931 meet. This offer was gratefully accepted by the British Government and work was immediately started on the construction of two new Supermarine racers to accommodate a new Rolls Royce "R" engine of vastly greater horsepower than that used in the Supermarine S-6 of 1929.

At the same time the F.A.I. announced new contest rules wherein it was decided to allow the participants to qualify and fly the speed course in the same operation. Under these revised regulations, each competitor was to take off at the starting gun, ascend to 150 ft., and then alight again on the water. After taxiing again for two minutes the entrant could then take off and fly the regular triangular speed course. This new rule, intended to shorten the trial period and eliminate costly delays due to inclement weather, placed new hardships on the designers of the racing aircraft by forcing them to include additional fuel, water and oil for this extra taxi and takeoff period. It also meant that this first landing would be made at a higher gross loading than had usually been anticipated in the basic design. Accordingly Mr. R. J. Mitchell and the Supermarine firm asked and obtained permission to move the remaining two S-6 racers back to the factory for modification to allow this capability. These two aircraft N-247 and N-248 were accordingly modified with new floats and greater water cooling area. Statically balanced control surfaces were also added to guard against flutter. These two aircraft after modification were known as S-6a models and the two new aircraft contracted with Supermarine were designated S-6b. With only seven months to produce two altogether new aircraft the Supermarine firm worked at top speed and the first machine S-1595 was able to make its first flight in early August. The second aircraft S-1596 followed shortly and the Calshot

(continued on page 6)

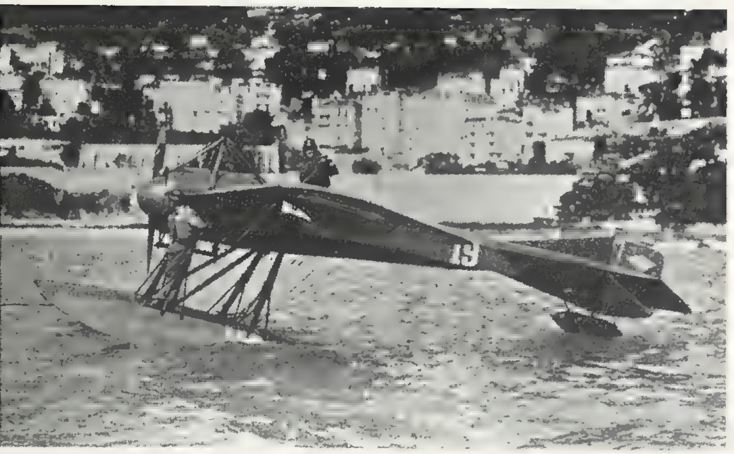

SECOND CONSECUTIVE VICTORY for Italy (1921) was, once again, a solo demonstration. Giovanni de Briganti averaged 117.8 mph in his Macchi M.7 racer after the other competitors, two of his countrymen in Macchi flying boats, dropped out. *Photo—USAF*


PRIVATE ACHIEVEMENT was responsible for the return of the Trophy to England in 1922. The Napier-powered Supermarine *Sea Lion II*, skillfully piloted by Capt. H. C. Baird, won the event with a speed of 145.7 mph for 13 laps. *Photo—Supermarine*

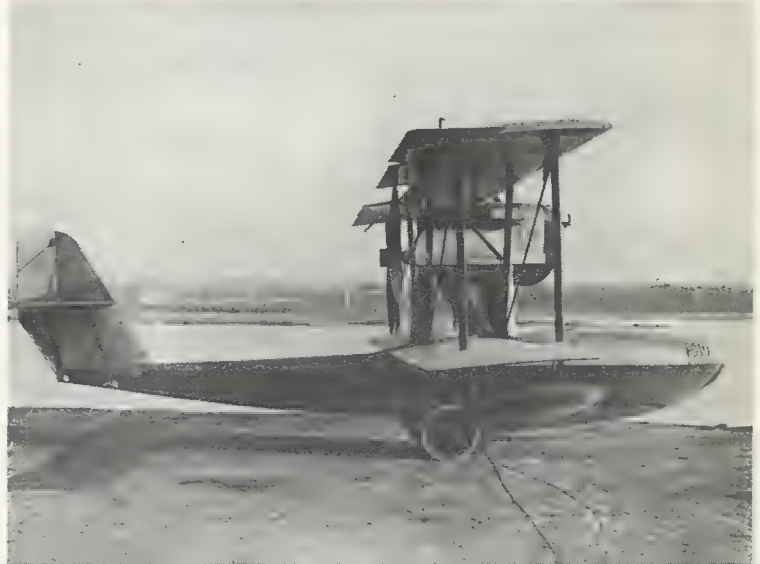


GREATEST OF ALL, perhaps, was the 1914 Sopwith biplane. Piloted by Howard Pixton, the second Trophy winner averaged 86.78 mph and later set a seaplane record of 92 mph. A float version of the *Tabloid*, it not only helped establish the 20-year supremacy of the small, fast biplane fighter, but was immediately developed into the Sopwith *Baby* seaplane scout. The latter, often called the Sopwith *Schneider*, served with the Royal Navy from late 1914 until the signing of the Armistice. It was also built by Blackburn, Ltd.; many of the Blackburn *Babies* were sent to the Royal Norwegian Navy for use in the rugged North Sea area. Meanwhile, the land model, the *Tabloid*, also was used in the early days of the war by the Navy and the RFC, developing into the famous Sopwith *Pup* and *Camel* fighters. Probably no airplane has had as much influence on fighter design as the tiny (25′ 6″ span) *Tabloid* type. It set the pattern for many years and put the famous Sopwith firm in business. *Photo—Hawker*

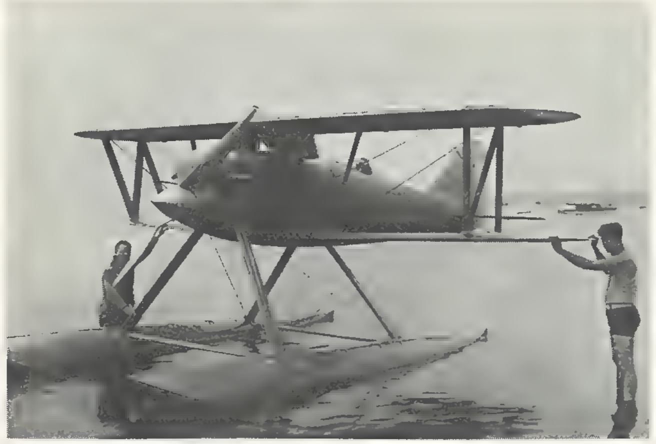
VICTOR by default of the first (1913) Schneider race, Marcel Prevost's Deperdussin was the only entrant to finish. Average speed was about 61 mph, but time lost recrossing the finish line reduced the official rate to 45.75 mph. *Photo—Smithsonian*



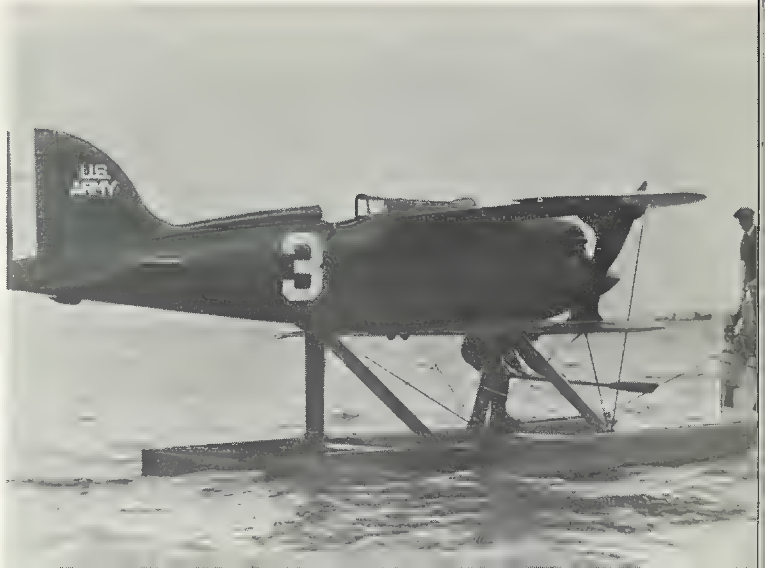
ONE-MAN RACE was flown by Italy's Luigi Bologna in the 1920 event. No British planes had entered the contest, and France withdrew its entry at the last moment. The little Savoia S-19 finished the 10-lap race alone, averaging 107.2 mph. *Photo—SIAI*

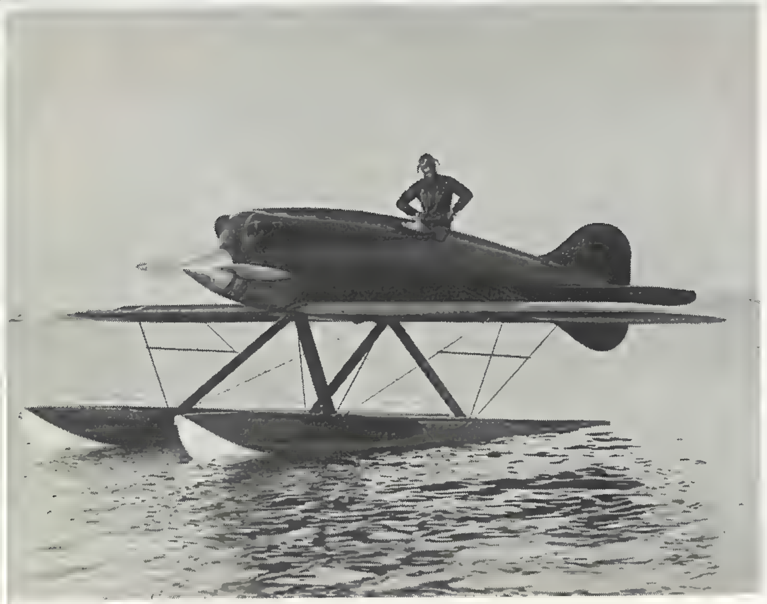


AMERICA'S FIRST BID for the Trophy in 1923 was to cause a revolution in seaplane design. The Navy Curtiss CR-3 racers, with D-12A engines, finished one, two ahead of England's Baird. Lt. D. Rittenhouse averaged 177.38 mph to win. *Photo—US Navy*

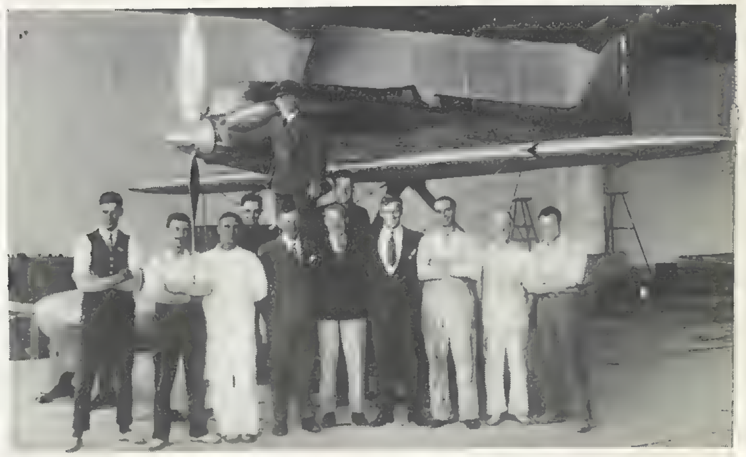


THE LAST BIPLANE to win the coveted Schneider Trophy was the Army's black and yellow Curtiss R3C-2. In October 1925, Lt. James Doolittle smashed all existing records with a speed of 232.57 mph, beating the second-place winner by 33 mph. *Photo—USN*





ITALY'S SLEEK RED Macchi M-39 beat America's ill-fated Navy team in 1926, but the Curtiss R3C-2 managed to take second place despite a 200-hp deficit. The more powerful Curtiss R3C-3 and -4 racers were eliminated by a series of mishaps. *Photo—US Navy*



HIGH SPEED FLIGHT of the Royal Air Force was formed for the 1927 event. Designer R. J. Mitchell produced the Supermarine S.5 monoplane, powered by a geared Napier *Lion* engine of 870 hp. Flt. Lt. S. N. Webster averaged 281.65 mph to win. *Photo—IAS*

(continued from page 4)

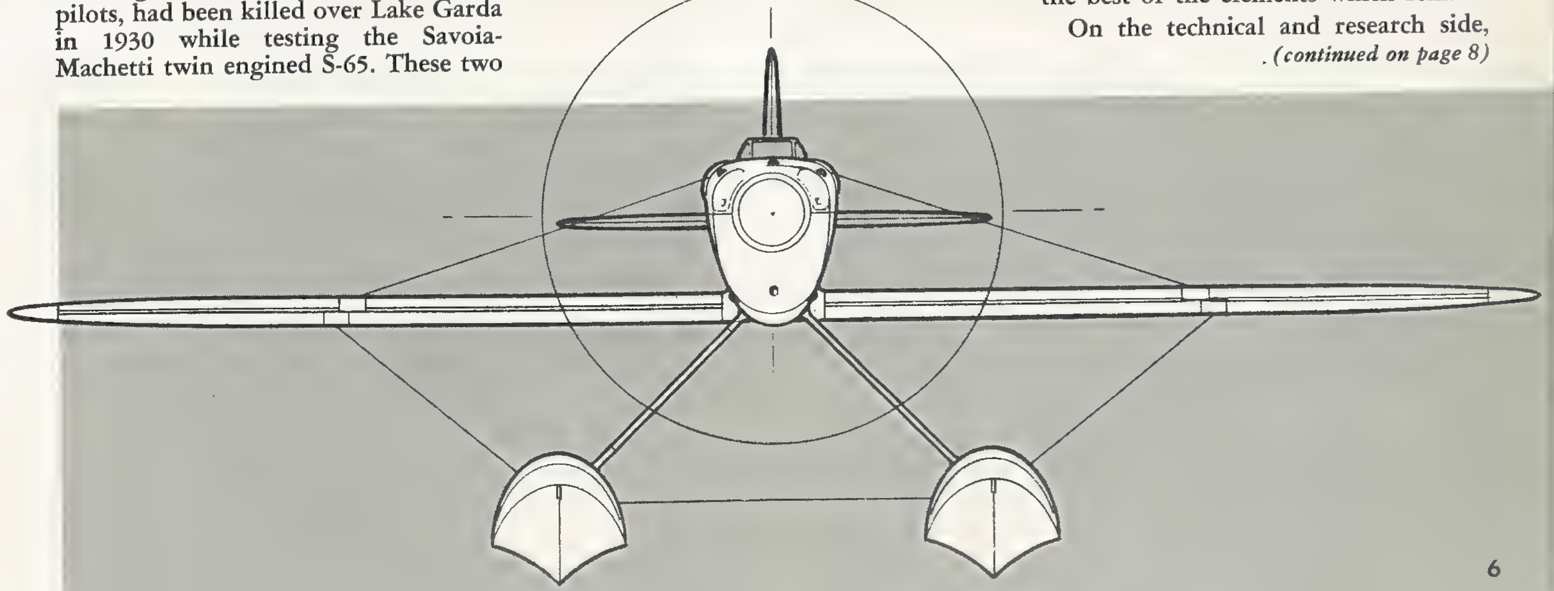
base began extensive testing of the machines to give both the aircraft and the pilots every opportunity to become acquainted.

At this point the penalty of progress was to sorely try the courage of each of the country's teams training for the all important 1931 contest. In France, on July 30, M. Bougault was killed while testing a Bernard-Hispano racer over the waters of Etang de Berre near Marseilles. In Italy on August 3rd, the popular Capt. Monti, a participant in the 1929 race at the Solent, was killed in a takeoff accident while flying one of the modified S-6a seaplanes (N-247). These unfortunate deaths were a stiff price to pay for the advancement of the science of aeronautics but the history of man's emergence from the darkness of ignorance is full of the sacrifices of such men. Through their deaths many more would live safely to carry on the challenge of flight. The plucky Dal pilots, had been killed over Lake Garda in 1930 while testing the Savoia-Machetti twin engined S-65. These two deaths at Lake Garda gave some indication of the effort being put forth by the Italian aircraft industry to regain possession of the Schneider Trophy.

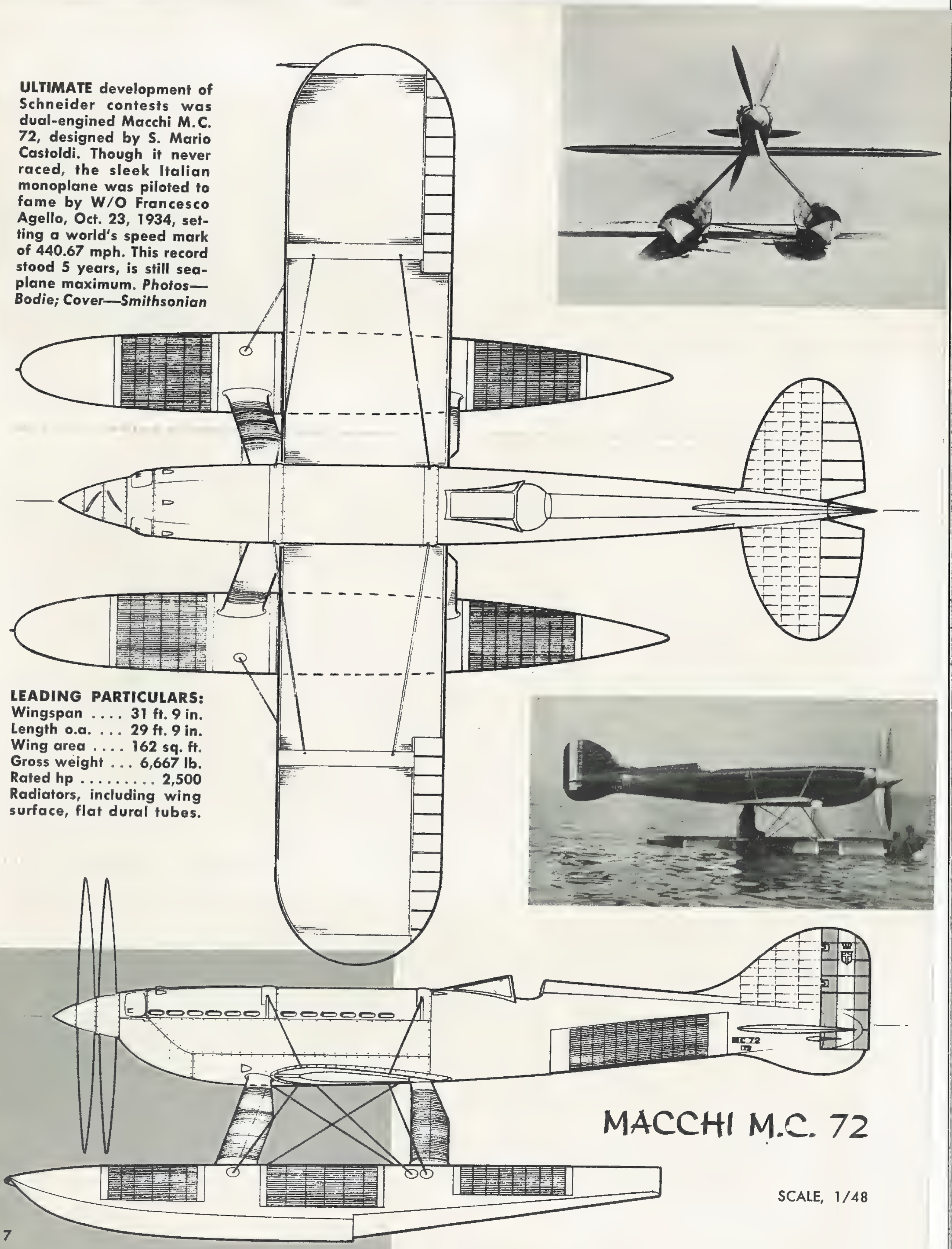
Up until a few days before the scheduled date of the contest on September 12th, it was hoped that France and Italy could participate but technical difficulties proved insurmountable for the short time remaining and both countries reluctantly announced their withdrawal from the contest. In an editorial of "Flight" magazine for September 11th, 1931 the following is quoted: "The inability of Italy and France to raise teams to make good their challenge for the Schneider Trophy contest on September 12 is a matter of the most extreme regret to everyone. The Schneider contest is an affair of many aspects. One side is sporting: one is technical: and one is commercial. The pilots represent chiefly, though by no means exclusively, the sporting side. They like to match their skill in flying against the best pilots that our friendly rivals can send against them. When there are no rivals to beat, the sporting side of the contest vanishes. Sq. Ldr. Orlebar and his fine team are naturally bitterly disappointed at finding themselves deprived of the chance of a trial by skill. We have no doubt that the pilots of Italy and France are equally disappointed—in fact they may feel more sore, for the position implies some breakdown in the national organization, and the pilots may suffer from the feeling that their nations have not even gone down fighting in a good sporting match. In 1929 the pilots of Italy won great honour for their nation by the splendid effort they made to drive untried machines and engines around the course. However, the sporting element has gone out of this year's Schneider contest, and we must make the best of the elements which remain.

On the technical and research side,

(continued on page 8)



ULTIMATE development of Schneider contests was dual-engined Macchi M.C. 72, designed by S. Mario Castoldi. Though it never raced, the sleek Italian monoplane was piloted to fame by W/O Francesco Agello, Oct. 23, 1934, setting a world's speed mark of 440.67 mph. This record stood 5 years, is still seaplane maximum. *Photos—Bodie; Cover—Smithsonian*



LEADING PARTICULARS:

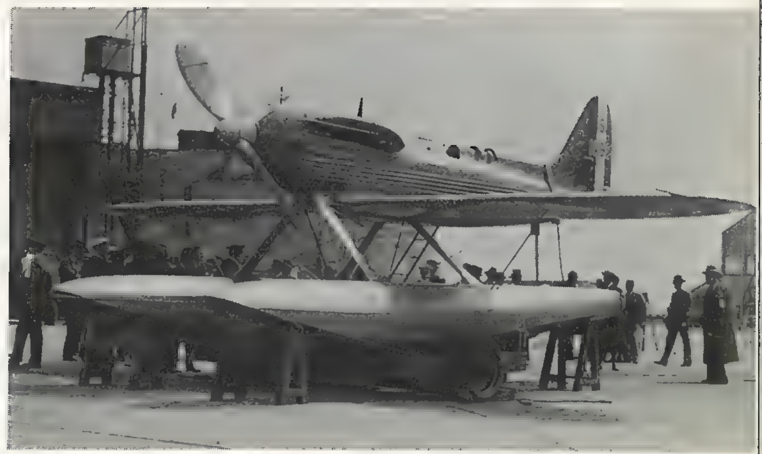
Wingspan	31 ft. 9 in.
Length o.a.	29 ft. 9 in.
Wing area	162 sq. ft.
Gross weight	6,667 lb.
Rated hp	2,500

Radiators, including wing surface, flat dural tubes.

MACCHI M.C. 72

SCALE, 1/48

MITCHELL'S GENIUS again won the Trophy for England in 1929. His new Supermarine S-6 averaged 328 mph, flown by F/O Waghorn, and five days later, Sept. 12, S/L Orlebar piloted the same airplane to a speed record of 357.7 mph. *Photo—Vickers*



BRITISH TRIUMPH in 1931 ended the Schneider contests and gave England permanent possession of the Trophy. Though it flew a one-plane "race," the Supermarine S-6B proved its worth Sept. 29, 1931, setting a speed mark of 407 mph. *Photo—Vickers*

(continued from page 6)

this year's contest marks no startling improvement in design such as marked the 1926, when Italy won with a low wing monoplane; that of 1927, when the Supermarine-Napier S.5, with its geared engine, marked a great step in advance; or of the last contest, when the Rolls Royce "R" engine made its sensational appearance on the scene. This year Mr. Mitchell has had only a few months in which to make what improvements could be made within narrow limits to the design known as S.6. It is believed that with the limits imposed he has done wonders, and it is common knowledge that the type S.6 "B" is a much better seaplane even than the modified S.6 "A." Mr. Rowledge has also got a considerable amount of extra power out of the "R" engine.

Of the results of the research which the French put into their preparations for the contest but little is known. Italy is said to have attempted to make a great and sensational step forward by placing two engines tandem and driving both propellers through gears and shafts (one shaft running through the center of the other), both propellers running in opposite directions close together in front of the forward engine. The Schneider contest has in its time provoked many novel ideas, and we applaud attempts to develop novel ideas even when they do not result in winning the trophy. Flying would never have made progress if men had not indulged in originality, and made attempts which could hardly command immediate success. Italy, as the country which brought the trophy back to Europe in 1926, and as the home of numerous original attempts to find new methods of increasing speed, has played a worthy part in the history of the Schneider.

The third aspect of the Schneider contest is commercial. Every aircraft building nation desires to sell its products abroad. That nation which has for the time held the trophy has always had a strong recommendation in the world's aircraft markets. It is generally and rightly held that the nation which can win the Schneider trophy possesses the best designers of the time."

Because of the withdrawal of France and Italy the day of the contest saw but one lone Supermarine S.6b (S-1595) piloted by Flt. Lt. John N. Boothman undergo the navigability trials and then fly the course. As each lap of the blue and silver seaplane was announced it was obvious that Boothman had been given instructions to fly conservatively and not jeopardize the safety of himself or the aircraft. His first lap speed was 343.1 mph, his second 342.7, the third 340.0, the fourth 338.3, the fifth 339.6, the sixth 339.4, and as the graceful racer roared by the Ryde Pier on the start of his seventh and last lap it was with some regret that the realization came to the thousands of spectators that this tiny monoplane was signing the death warrant of the Schneider Trophy Contests. Zooming sharply past the pier at the conclusion of his last lap, Boothman averaged 340.08 mph for the course and won permanent possession of the trophy for England.

Later in the day, Flt. Lt. Stainforth took off in S.6b (S-1596) and flying five passes across a 3-kilometer course established a new world speed record for all types of aircraft of 379.05 mph. A suitable conclusion to a historic day's events.

The purpose for which M. Jacques Schneider gave the trophy was to encourage research in, and the betterment of high-speed aircraft. That purpose has been fulfilled in a manner which must have been beyond M. Schneider's wildest dreams, for this, the eleventh contest, had raised the speed at which the course has been flown from 45.75 mph in 1913 to 340.08 mph in 1931. To him, therefore, we owe a debt of gratitude, inasmuch as he gave the incentive through which speed was born.

The Italians, not to be dismayed by the technical difficulties confronting their Macchi MC-72 racers, continued to develop the Fiat tandem engines and by 1933 were making consistently successful flights at speeds up to 450 mph. Accordingly, on October 23rd, 1934, Lt. Agello flew four passes over a 3-kilometer course at Lake Garda to establish a world's speed record for seaplanes of 440.67 mph. His Macchi, fitted with a Fiat A.S.6 engine of 2800 hp, thus vindicated the efforts of the Italian industry by setting a speed record which will probably stand for all time. Flt. Lt. Stainforth, on Sept. 29, 1931, flying a S.6b with a special Rolls Royce racing engine, had set a new 3-kilometer record of 407.5 mph, thus exceeding 400 mph for the first time in history, but the abandonment of the high-speed flight project by the British government allowed the Italians to continue to forge ahead. It is not likely that anyone in the world will ever produce a propeller-driven aircraft, of a seaplane type, which which can exceed Lt. Agello's mark. This somewhat emphasizes the impetus given to the science of high-speed flight by the Schneider Contests. They served their purpose and are now history.

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CONTENTS

World War One Aircraft Markings by Peter M. Bowers.... 2
Salute to a Champion.... 3
Curtiss Army Racer—Scale Drawing.... 4
Fokker in the United States by John Sloan (Part 2).... 6

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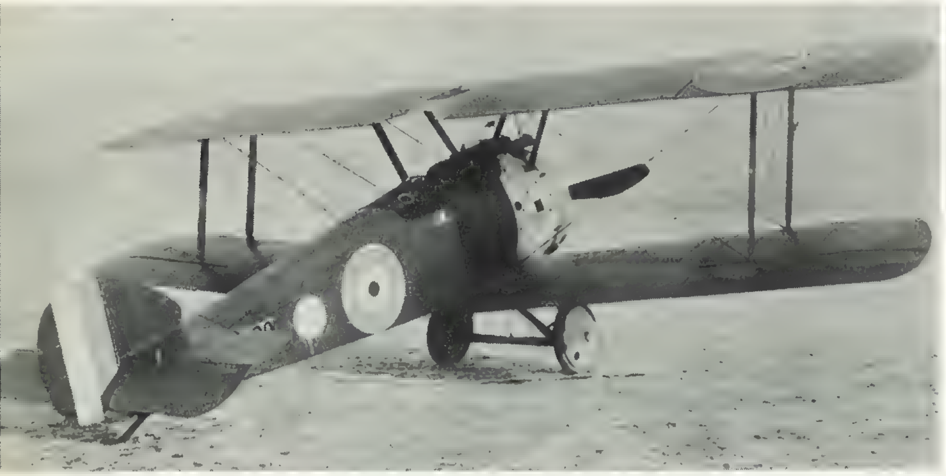


FIGURE 1 (above) Red looks darker than blue in actual WWI photographs.

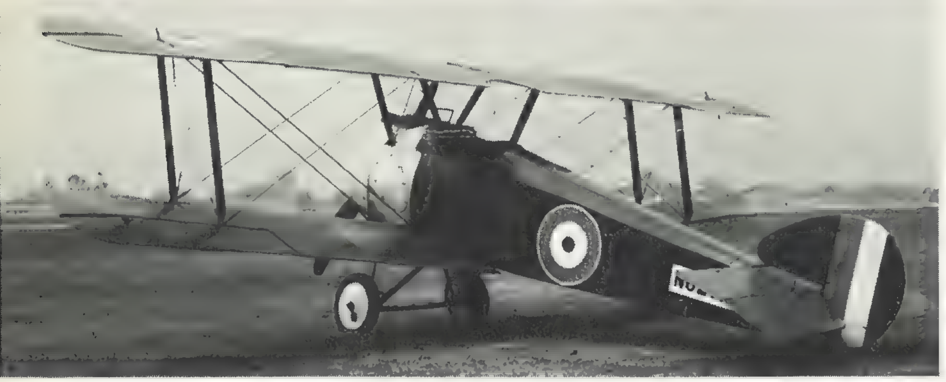
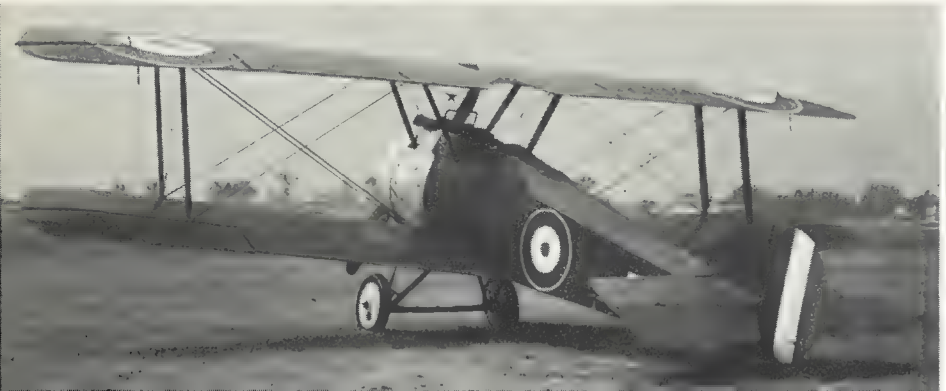


FIGURE 2 (above) and **FIGURE 3** (below) Today's pictures are deceiving.



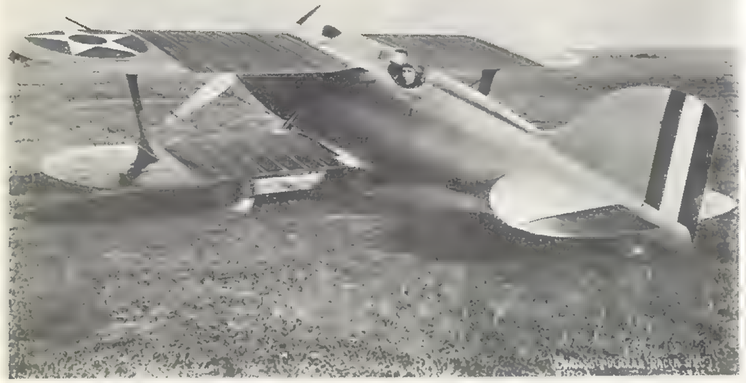
World War One
Aircraft Markings
BY PETER M. BOWERS
PART ONE

The renewal of interest in the World War I period of aviation and the resulting increase in the number of actual WW-I aircraft being restored to flying condition has brought up allied problems of correct markings and photography. This article will discuss the use of proper paint and the chromatic ratings of camera film.

Figure I shows a Sopwith Camel captured by the Germans in 1917 and photographed in its original markings. British markings, then as now, had the blue ring of the tricolor cocarde on the outside, and the center was red. Rudder striping was in the order of red at the trailing edge, then white, and blue at the leading edge. Notice that the blue shows up quite light, and that the red is practically black in the photograph. This is a characteristic of ORTHOCHROMATIC film, which was the only kind in use at that time.

Figure 2 shows another Sopwith Camel, owned by Frank Tallman of Glenview, Illinois, which is presently in airworthy condition. The photograph was taken at the National Air Show in 1955. Notice, however, that although the markings are authentic as to proportion, color, and location, the contrast between the red and the blue is not nearly as pronounced as in the 1917 photo, even though the 1955 photo was taken with Orthochromatic film. Figure 3, which was taken at the same time, but on PANCHROMATIC film without a filter, produces a print that reverses the color values of Orthochromatic as far as red and blue are concerned.

The reason for the difference in color values between the markings in Figures 1 and 2 is that the blue used for insignia during World War I was considerably lighter in shade than that used today. Modern American "Insignia Blue" is so dark that it is almost black, and photographs like it, even on Orthochromatic film. "Insignia Red," too, is darker than the vermillion types of red used during WW-1. The blues used by American and British aircraft were equivalent to or lighter than modern "True Blue," or the shade of Air Corps Blue used on the fuselages of Army airplanes just prior to World War II. Both the U.S. Army and Navy switched to the darker shades of paint in the middle 1920's, but the British retained the lighter shade of blue until WW-II. The shade of blue used by the French Air Force was even lighter, and hardly showed up at all in black-and-white photographs. *(to be continued)*



LAST PULITZER RACE was won by Lt. Cy Bettis in No. 43 (cover). Bettis is shown (above) in the first R3C-1 at Garden City. Designed under the direction of T. P. Wright, the racer had a 619 hp Curtiss V-1400 engine; could exceed 260 mph. Thickness ratio of wings was only 6%. Note skin radiators. *Photo—W. M. Bodie*

THE ILL-FATED R3C-3 was reconstructed from the former R3C-2, No. 1, by the Naval Aircraft Factory in 1926. A 700 hp Packard 2A-1500 engine replaced the Curtiss V-1400, and the airframe was extensively modified. It turned over and sank during trials. Pilot Tomlinson raced in the practice plane. *Photo—Bodie*

SALUTE TO A CHAMPION

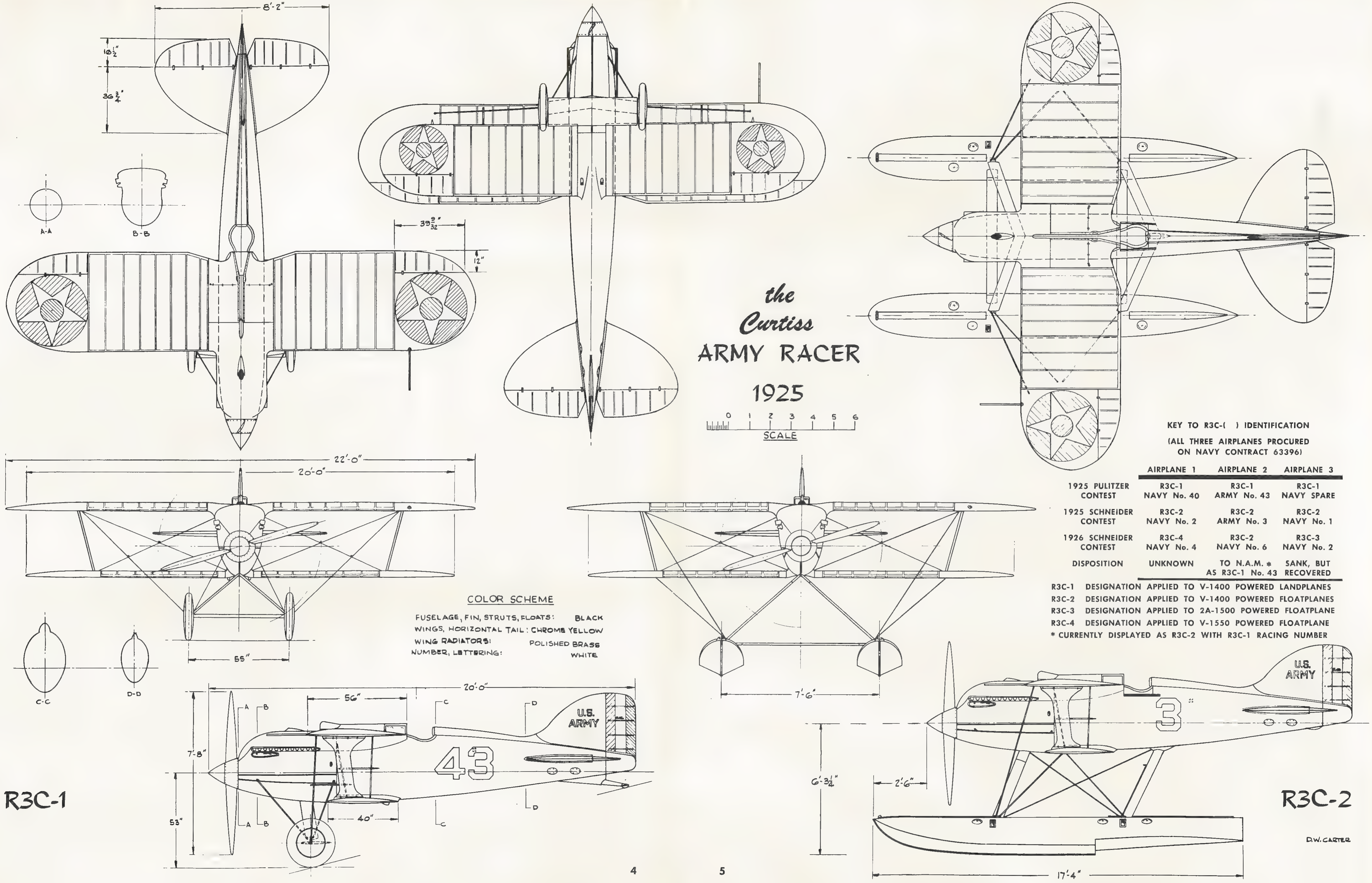
Three decades of aeronautical progress have dimmed the achievements of a small group of engineers and pilots who came within a whisker of attaining international immortality. It was just thirty years ago that pilots of the Army, Navy, and Marine Corps nearly gained permanent possession of the much coveted Schneider Trophy for the United States. Curtiss Aeroplane & Motor Co. engineers had constructed three biplane racers which captured the famed race event in 1925, and narrowly missed a victory in the following year. A single remaining example of this trio of Curtiss R3C racers is maintained in good condition in the National Air Museum in Washington, D.C. This airplane, No. 43, is the one example delivered to the Army Air Service. It was flown to victory in the Pulitzer Trophy Race in 1925 by Lt. Cy Bettis. With floats installed a few days later, and renumbered for the event, it was flown by Lt. James Doolittle to win the Schneider Trophy Contest for the second consecutive time for America. With virtually no changes, it placed second in the 1926 contest. Its more powerful, modified sisters were victims of unkind fate, and the Italians attained victory in their brilliant red Macchi monoplanes, thus heralding the return of this type to the winner's circle. In its final racing appearance, the Army-Curtiss R3C-2 was flown by a famous Marine, Lt. C. F. Schilt.

Maximum level speed of the 700 hp R3C-3 and -4 versions is not known, but the R3C-1 landplane versions attained 265 mph on 619 hp, a rather remarkable performance for that period.

NAVY'S HOPES FOR VICTORY were pinned on the R3C-4, which was the original R3C-1 repowered with a Curtiss V-1550 engine of 700 hp. Entered in the 1926 Schneider event at Hampton Roads, Va., it was forced down in the last lap. Note the additional air intake and revised float design on this version. *Photo—Bodie*

A MEDAL OF HONOR would be appropriate for Army's grand old Curtiss R3C-1/-2. After winning the 1925 Pulitzer Trophy race, it went on to triumph in the Schneider Cup event and set three new speed records. Lt. C. F. Schilt, USMC, flew it to second place in 1926. It reposes in National Air Museum. *Photo—N.A.M.*

the Curtiss
ARMY RACER
1925



KEY TO R3C-( ) IDENTIFICATION

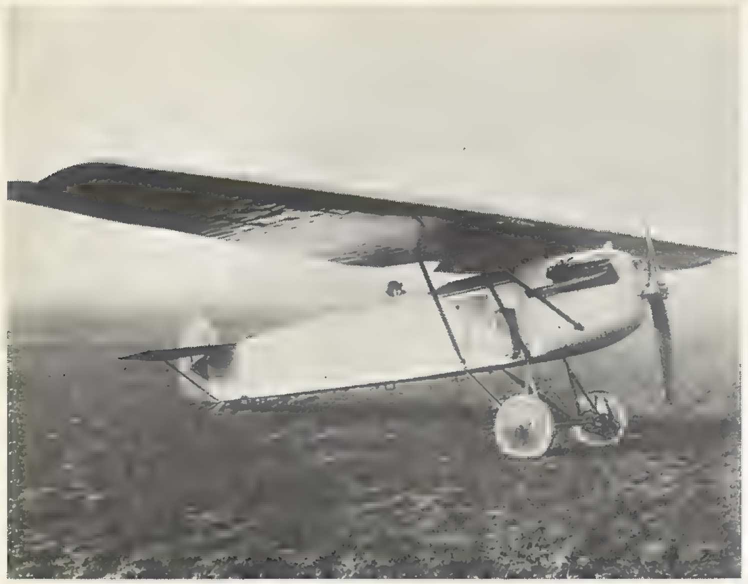
(ALL THREE AIRPLANES PROCURED ON NAVY CONTRACT 63396)

	AIRPLANE 1	AIRPLANE 2	AIRPLANE 3
1925 PULITZER CONTEST	R3C-1 NAVY No. 40	R3C-1 ARMY No. 43	R3C-1 NAVY SPARE
1925 SCHNEIDER CONTEST	R3C-2 NAVY No. 2	R3C-2 ARMY No. 3	R3C-2 NAVY No. 1
1926 SCHNEIDER CONTEST	R3C-4 NAVY No. 4	R3C-2 NAVY No. 6	R3C-3 NAVY No. 2
DISPOSITION	UNKNOWN	TO N.A.M. * AS R3C-1 No. 43	SANK, BUT RECOVERED

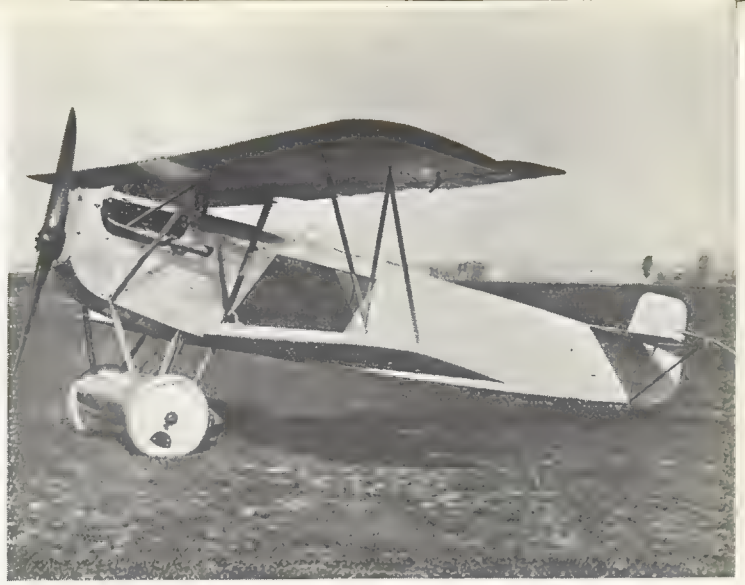
R3C-1 DESIGNATION APPLIED TO V-1400 POWERED LANDPLANES
R3C-2 DESIGNATION APPLIED TO V-1400 POWERED FLOATPLANES
R3C-3 DESIGNATION APPLIED TO 2A-1500 POWERED FLOATPLANE
R3C-4 DESIGNATION APPLIED TO V-1550 POWERED FLOATPLANE
* CURRENTLY DISPLAYED AS R3C-2 WITH R3C-1 RACING NUMBER

COLOR SCHEME

FUSELAGE, FIN, STRUTS, FLOATS:	BLACK
WINGS, HORIZONTAL TAIL:	CHROME YELLOW
WING RADIATORS:	POLISHED BRASS
NUMBER, LETTERING:	WHITE



FIRST FOKKERS SOLD TO U.S. after WWI were ten PW-5's like the V-40 model, but with flat frontal radiators. Similarity to D-VIII is seen in tapered cantilever wing, cabane strut arrangement. Advanced version had retractable radiators, 300 hp Wright-Martin engine. OX-5 model became TW-4. *Photo—Sloan*



LINES OF THE FAMOUS D-VII are seen in the D.IX above, which used 335 hp Wright-Martin H-2 (Hispano) engine, Stock D-VII wings, metal covered fuselage. Note fuel tank between wheels. Performance was not greatly improved over D-VII. Only one was delivered to U.S. in 1923 as PW-6. Dutch picture. *Photo—Sloan*

Fokker IN THE UNITED STATES

PART 2

BY JOHN SLOAN

The years 1927 to 1931 brought the popularity of Fokker aircraft to an ever greater appreciation, first by the famous flights of Byrd, Kingsford-Smith, Earhart, Maitland and Hegenberger, and of Spaatz, Eaker and Quesada, later by the speed and luxury of the Super-Trimotor in commercial service.

The "America" and the "Bird of Paradise" made aviation history in 1927. The Trans-Atlantic flight of the "America" with Byrd, Balchen, Noville and Acosta is an epic oft retold. The thorough preparation for and the precision with which the flight was carried out gave it the solid impression of a scientifically backed expedition for the serious purpose of establishing an air travel route. The expert handling and landing of the "America," in pitch darkness, on the seacoast of France is truly remarkable. But this was after having flown directly to Paris, which was found fogbound. Byrd and his crew again demonstrated the feasibility of long range air navigation.

In June of 1927, on the very same days that the "America" was winging across the Atlantic, Lts. Maitland and Hegenberger flew from Oakland to Honolulu in a standard Army Trimotor C-2, the "Bird of Paradise." En route they received two radio messages from Cmdr. Noville on the "America" over the Atlantic. Their flight to Honolulu took 25 hours and 50 minutes.

On May 31, 1928 Charles Kingsford-Smith as pilot, C. P. T. Ulm as copilot, Harry W. Lyon as navigator and James Warner as radio operator took off from Oakland, California on the beginning of one of the most thrilling adventures in the history of aviation.

Kingsford-Smith had laid his plans for a Trans-Pacific flight in 1927, but with very meager funds. He and Ulm, both Australians, had scraped together enough to buy a cracked up Fokker Trimotor from Capt. George Wilkins in early 1927 and brought it to Mills Field, San Francisco for repair. Although all arrangements seemed to have been made, and the flight announced, their financial backers in Australia withdrew at the last moment, leaving them stranded with the Trimotor as their only asset. In December, 1927, the airplane was renamed the "Spirit of California" and it was announced that a try for the endurance record would be made. This was a fund raising attempt and it was financed by a San Francisco newspaper. The endurance record then stood at 52 hours, 22 minutes, held by German aviators Edzard and Risticz. On the 19th of January Kingsford-Smith and Ulm tried but were forced down at 50 hours, 8 minutes.

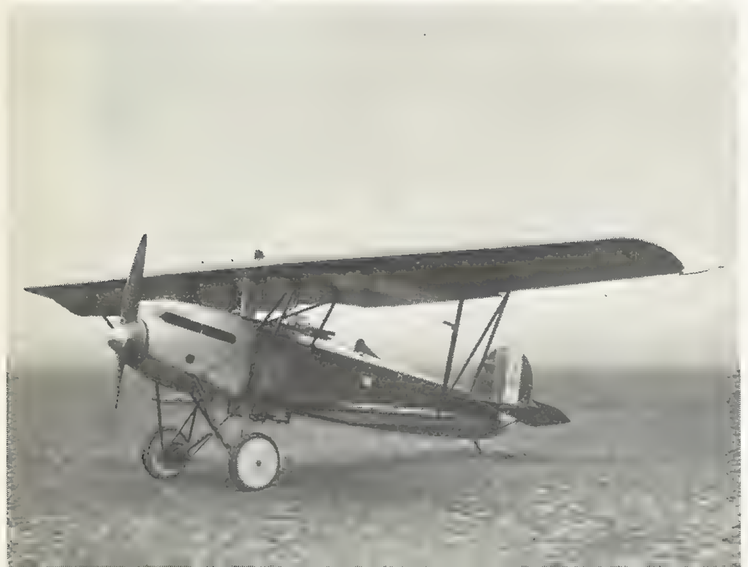
G. Allen Hancock was next persuaded to back the Trans-Pacific flight. The Trimotor was renamed again, the "Southern Cross" in honor of the star of that name and brought to the Santa Monica plant of Douglas Aircraft Co. for complete overhaul. On May 31, 1928 Kingsford-Smith, Ulm, Harry W. Lyon as navigator and James Warner as radio operator took off for Honolulu. Although not the first to fly to Hawaii, they blazed a new trail westward from there across the Pacific. They established the route and the navigation procedures used seven years later by Capt. Ed Musich when he inaugurated the first Trans-Pacific flight of Pan American Airways.

From Hawaii, the island of Suva lay 3120 miles distant, the only one in the direction of Australia which had a level landing spot for aircraft. Once they left the radio beam behind there was no way in which they could check the accuracy of their drift and if they were not over Suva at the reckoned time there would be no difference between 20 miles and 2000 miles in the result.

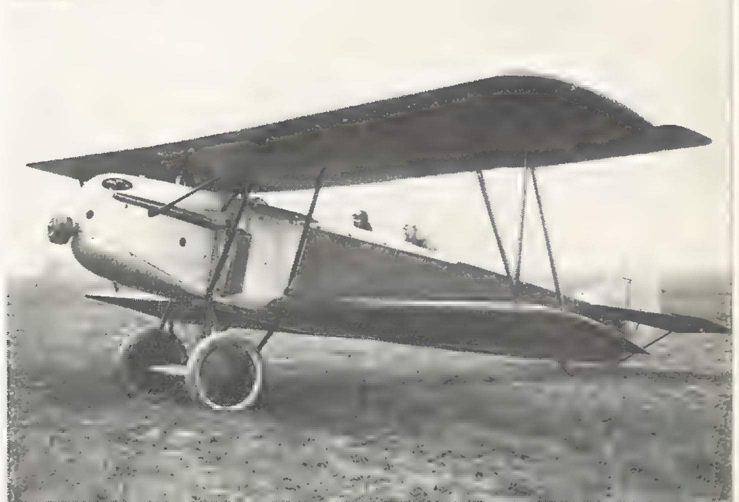
The hop from Hawaii to Suva took 34 hours, almost constantly in bad weather, with winds lashing them from sea level to 8000 feet and back again. But they hit the island target right on the nose, an amazing feat. Kingsford-Smith landed the Fokker in a clearing only 75 by 400 yards, little enough for a pilot after 34 hours of tension. After that the rest of their flight around the world seemed tame by comparison. They arrived back in Oakland, California in June, 1930. The "Southern Cross" is now in a museum in Canberra.

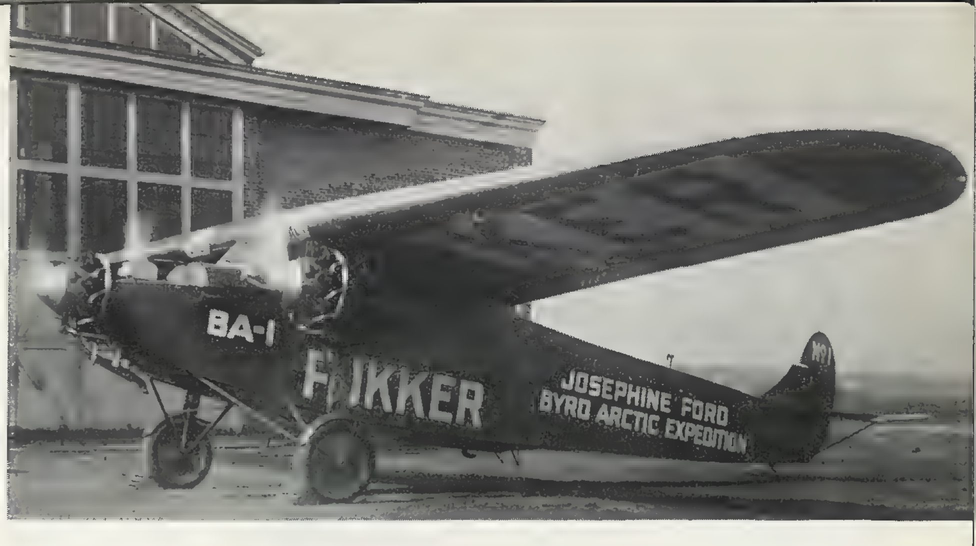
(continued on page 8)

PW-7 OF 1923 used the Curtiss D-12 engine of 440 hp. Three delivered had serials A.S. 68580, 68581, (above) and 68582. Performance of PW-7 was good; climb to 10,000 ft in 9.3 minutes, cruise at 130 mph. Wings and fuselage were fabric covered. Burnished cowling was feature of many Fokkers. *Photo—S. Hudek*



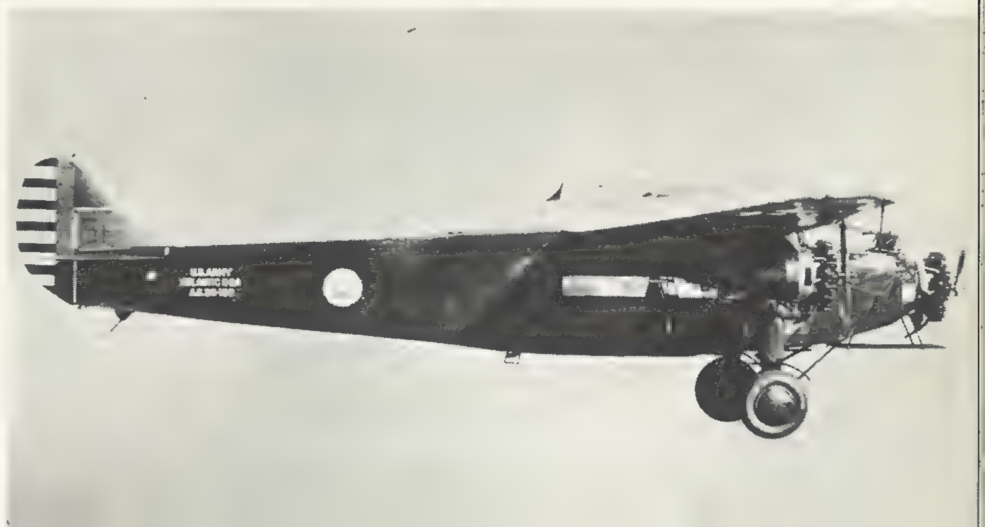
FOKKER DESIGNATION AS C-IV became the XCO-4 in this prototype with the *Liberty* engine and retractable side radiators, serial A.S. 68566. It was not successful as performance did not better the DH-4 still in service. Poor maneuverability, visibility hampered its purpose. Air Service bought 3. *Photo—Sloan*

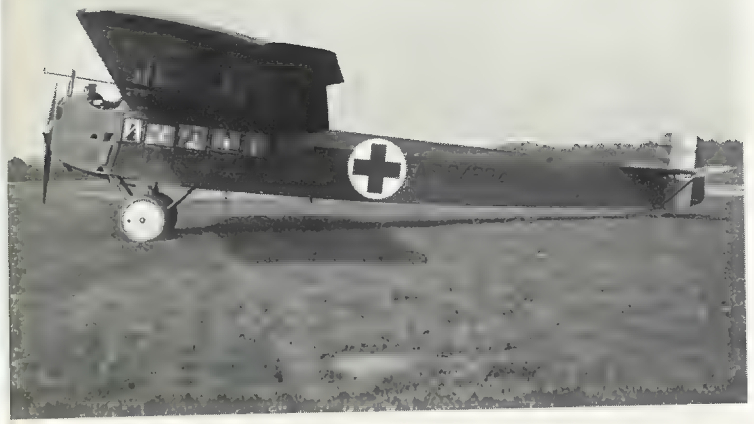




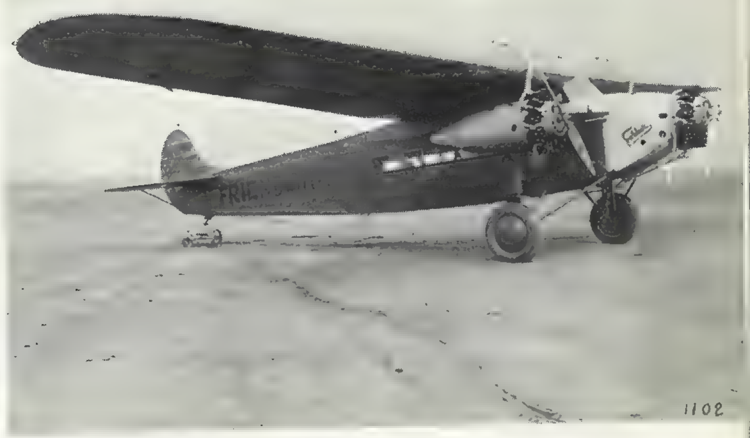
THE F.VIIB/3m WAS FIRST MADE IN 1925 using standard F.VIIA fuselage and wings, and flown over the North Pole by Lt. Cdr. Byrd and Floyd Bennett on May 9, 1926. The single engined F.VIIA was already in wide use in Europe. One of these had a long and interesting life. F.VIIA H-NADK went into service with K.L.M. in 1925, was sold to England's Capt. McIntosh in 1927 and reregistered G-EBTS, the "Princess Xenia." On Sept. 16th McIntosh and Col. Fitzmaurice attempted to fly the Atlantic westbound but were forced back by headwinds. In Nov., 1927 McIntosh and Bert Hinkler left Upavon, England attempting a flight to India, were forced down in Galicia. In 1928 Barnard and Alliott tried for India, were forced down but shipped G-EBTS on to Karachi. The return trip was successful; they made Karachi to London in 4½ days. Rechristened "The Spider" and given a new engine, G-EBTS took Barnard and Little on a record round trip flight from London to Karachi and return in just less than 8 days in August, 1929, and in April, 1930, to Capetown and back in 21 days. The plane was used for several years in display, charter, and ferry service between England and France. It went on one final trip to India with Capt. Barnard and was sold there, July 1934. *Photo—Sloan*

C-2A "QUESTION MARK" WAS FLOWN to West Coast for endurance flight by Maj. Spaatz, Capt. Eaker, Lts. Quesada and Halverson and Sgt. Hooe, from Washington where it was a part of the Bolling Fd. Detachment. The plane had been named by Eaker's wife; its purpose was to determine how long it could stay aloft. C-1's (Douglas) were provided at San Diego, Imperial and Los Angeles as tanker planes. The tankers rose in response to messages dropped from the Fokker. Most of the refueling was done over Metropolitan Airport in San Fernando Valley. Weather information was chalked on side of tanker or message plane. The Trimotor's main tank held 300 gallons, tanker planes 250, but usually less than this was transferred, especially late in the flight when engine power diminished. The Wright "Cyclone" engines were adjusted before the flight but rocker arm failure eventually forced the "Question Mark" to land; the gap between rocker and valve end had enlarged to as much as one half inch. On the 7th day of flight the left engine quit during refueling, the right engine was streaming oil and the center engine had reduced to 1300 rpm. After 150 hours, 40 minutes, 15 seconds of continuous flight the plane landed. Maj. Spaatz, leader, was awarded D.F.C. *Photo—Sloan*





A-2 AMBULANCE version was converted from one of two T-2's bought in 1922; actually stemmed from F-IV commercial type. Kelly and McReady flew T-2 across U.S. May 2, 1923 in 26 hours 50 minutes, first non-stop transcontinental flight. Their plane, Serial No. A.S. 64233, now rests in Smithsonian. *Photo—S. Hudek*



FRIENDSHIP of Stutz, Gordon, and Earhart was last of F.VIIB/3m's prior to *Super Trimotor* or F.X.-A model. Plane is shown before floats were mounted for Trans-Atlantic flight, which was made in nearly continuous storm from Trepassy Harbor, Nfld. to Burry Port, Wales in a little over 20 hours flying time. *Photo—Sloan*

(continued from page 7)

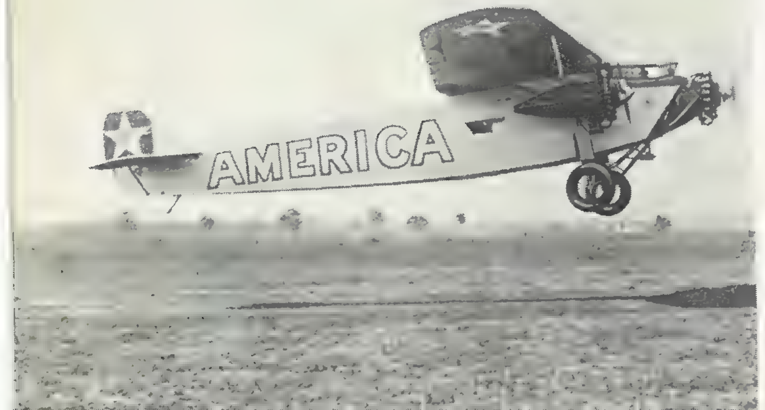
In 1928 Adm. Byrd began preparation for his Antarctic expedition. A Fokker Trimotor was ordered, and a Super Universal. The Super-U was named the "Virginia" and was taken along but the Trimotor was discarded in favor of a Ford Trimotor which Byrd named the "Floyd Bennett" in honor of his late friend, pilot and companion. The Fokker Trimotor was completed, however, and became the "Friendship" which Wilmer Stutz, Louis Gordon and Amelia Earhart flew eastbound across the Atlantic on June 17, 1928.

The endurance flight of the "Question Mark" was an experiment, made to try out the staying power of the engines. In the trial the Air Corps found out about other things; refueling in air, repairs while in flight, comforts for the crew, and it also helped immeasurably in that indefinable job called public relations. The attention which was focused on the "Question Mark" was very favorable, one of the best things the Air Corps had ever accomplished. The three officers who led this flight became generals in command of the most responsible positions during World War II. They were, in 1929, Major Carl "Tooey" Spaatz, Capt. Ira C. Eaker, and Capt. Elwood "Pete" Quesada.

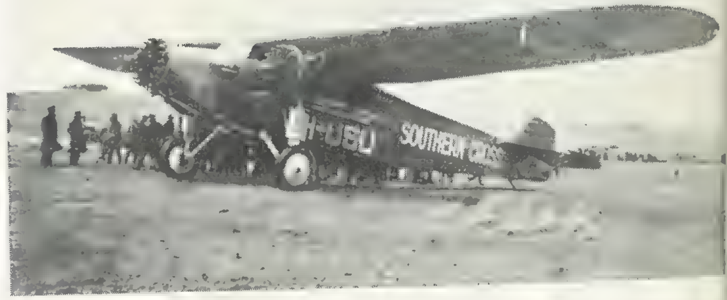
Turning now to the commercial airline development in the United States we find that Fokker airplanes were right in the thick of things. Trans-oceanic flights, endurance records and publicity tours were fine for one's reputation, but it is in the solid development of aircraft as a means of transportation that aircraft manufacturing paid off. 1926 brought the first burst of commercial activity, dedication of airports and inaugurations of airlines. These became more and more frequent into 1927, but the "Lone Eagle's" flight from New York to Paris in May, 1927 gave the entire aviation industry its most tremendous boost.

(to be continued)

***AMERICA* WAS ESPECIALLY BUILT** for Byrd's Trans-Atlantic flight with larger wing and a fuel tank separating front and rear compartments. Famous Floyd Bennett, injured in flight test mishap, was replaced by Bernt Balchen. Atlantic crossing of 42 hours pointed up need for improved weather reports. *Photo—Sloan*



THE *SOUTHERN CROSS* brought additional fame to Fokker aircraft and pilot Kingsford-Smith by epic flight around the world. It left Oakland, Calif., on May 31, 1928; returned in June 1930. Trip included the longest over-water flight made yet by dead reckoning, 3144 miles, Honolulu to Suva, Fiji Is. *Photo—Bowers*



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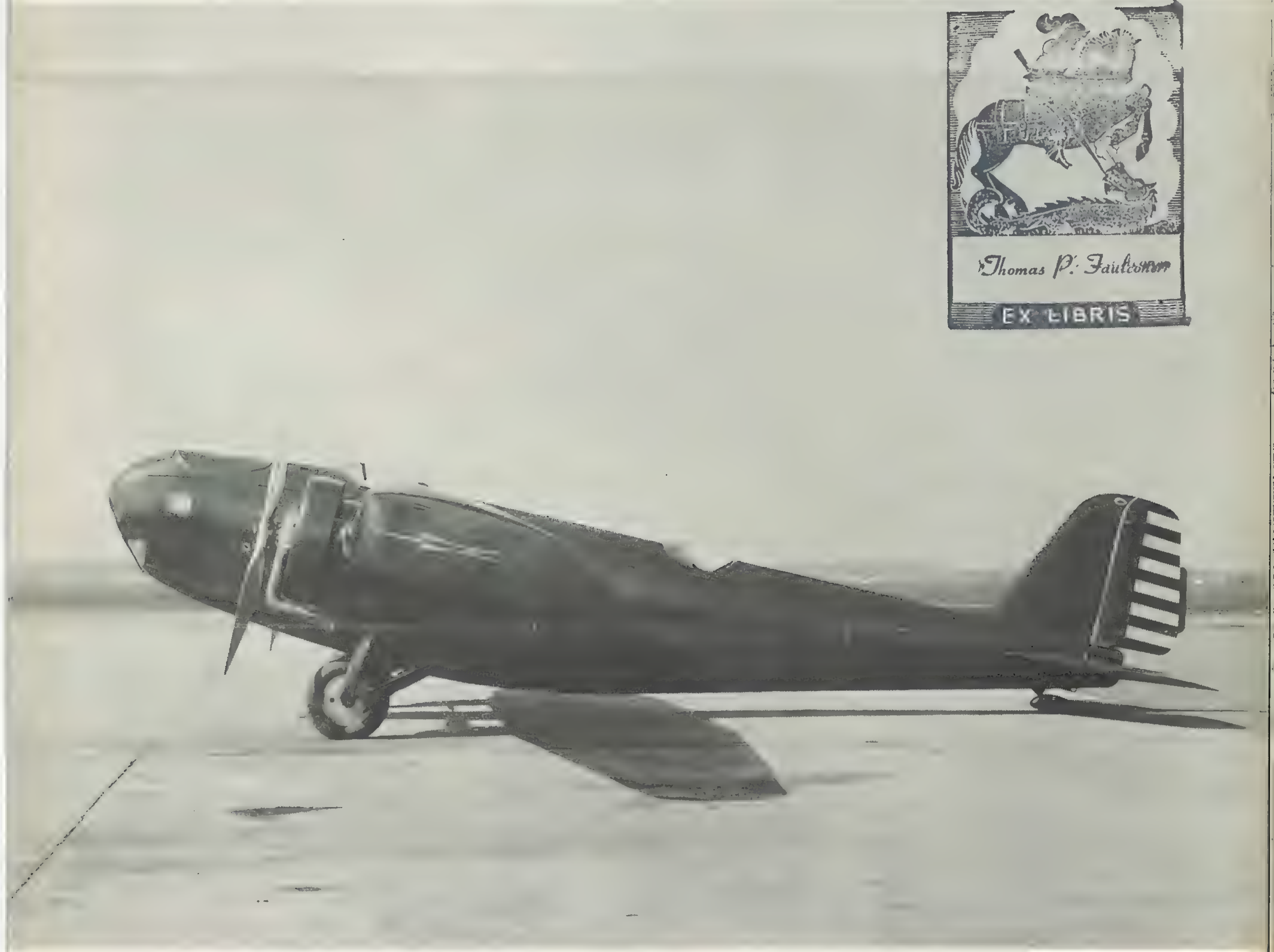

Thomas P. Faulconer
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CONTENTS

FEATURES

Early Birds.......... 2
The Career of Glenn L. Martin.......... 4
Glenn Martin's First Flight.......... Insert
Cover Story.......... 6
Courtney's Corner.......... 7
Current Historical Affairs.......... 7
Martin MB-1 Three-View.......... 8

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EARLY BIRDS

By Jack D. Canary

The large strides taken since World War II in the field of aircraft design and performance makes it difficult to superimpose a Wright model "B" pusher on an F-100 "Super Sabre." A bare 50 years separates these two aircraft designs.

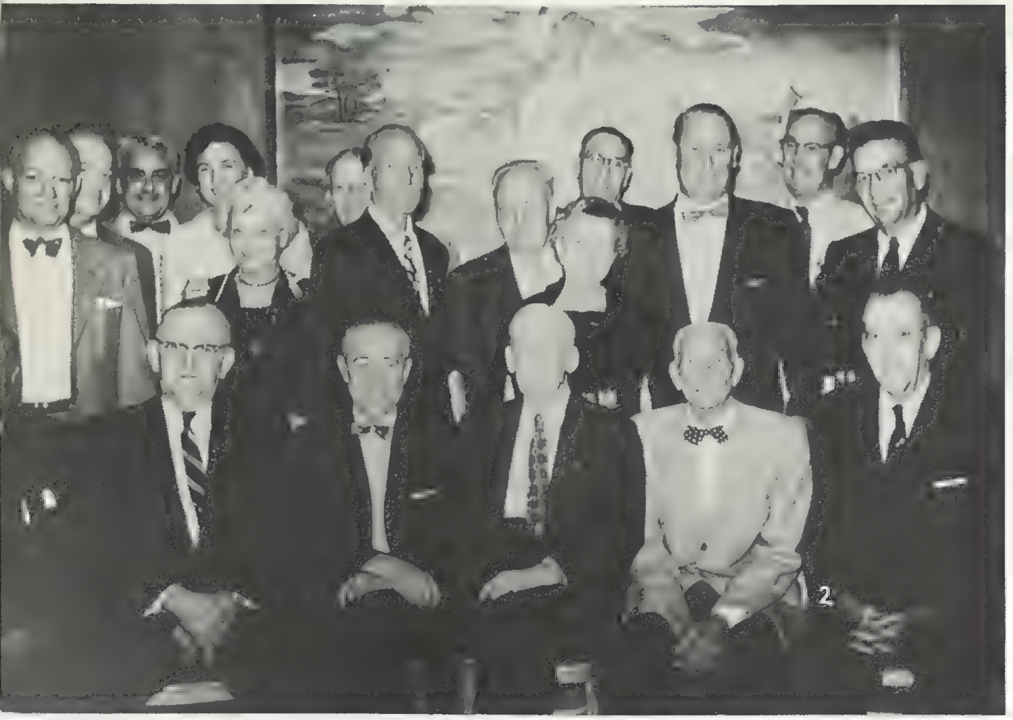
It is surprising to learn that the "Early Birds," a group of dedicated veterans of aviation, who learned to fly during the first 13 years of flight, are still extremely active in this year of 1956. Just as aviation is an active industry, so are the men who pioneered it. Hard to realize? Well, let's just go over the story of the "Early Birds" a moment and review their two principal functions, their membership requirements, and their activities.

It might come as news to many aviation enthusiasts that interest in historical aviation has its foundation in the biographies of these men. They are living testimonials of a pioneer group who nursed the nation's largest industry through its infancy.

According to the "Early Birds" constitution, their first principal function is to promote social and business relations among airmen in general, and among its members in particular; and second, to foster and preserve a national interest in aeronautics. Membership in the "Early Birds" is "limited to those who piloted a glider or airplane, gas balloon or airship prior to December 17, 1916, upon review of evidence deemed sufficiently reliable by the membership committee and approved by the board of governors, except: nationals of countries other than the United States engaged in World War I must have met the foregoing conditions prior to August 4, 1914."

The 1956 President of the "Early Birds" is Capt. Ralph Barnaby, USN, Ret. and among the trustees for the year 1955-1956 is found the name of Glenn L. Martin, to which this issue is dedicated. A wonderfully informative "Early Bird" magazine, called "Chirp" is edited by George Scragg; and with division chairmen in every area of the United States, the members have frequent meetings and social functions.

Members of the Los Angeles Historical Committee were guests at a West Coast "Early Bird" meeting held last May. The meeting was a memorable experience for all fortunate enough to attend.



The Spring meeting of the West Coast Early Birds was held in Los Angeles in May. Guests included members of the IAS Los Angeles Historical Committee. Early Birds who attended the meeting included, (L to R, bottom row): Ivan P. Wheaton, George H. Scragg, Capt. Ralph S. Barnaby, Gen. Frank P. Lahm, Paul Stockton and Col. Warren S. Eaton. Top row (L to R): Howard J. Heindell, Mortimer F. Bates, Thomas E. Steptoe, Teel Hildebrandt (NACA West Coast Office), Hilder Smith, W. A. Lamkey, Felip A. Bjorklund, Elling O. Weeks, Buel H. Canady, "Tiny" Broadwick, Tom Hamilton, P. H. Spencer and Waldo D. Waterman.

GLENN L. MARTIN

1886 - 1956

Born Macksburg, Iowa, January 17, 1886, son of Clarence Y. and Minta (De Long) Martin. Education, Kansas Wesleyan University. Obtained Aviator's Certificate No. 56 in August, 1911, qualified as Expert Aviator and was issued Certificate No. 2 by the Aero Club of America, incorporated the Glenn L. Martin Company the same year. As a sport and exhibition pilot Martin attained early prominence which aided the business of building aircraft, his ultimate goal in life. From the first he demonstrated business ability which included selling the TT "tractor" to the U. S. Army Signal Corps in 1913, founding the Wright-Martin Aeronautical Corp. in 1916, and soon thereafter, the formation of the now oldest American aircraft manufacturing concern in the U. S., the Glenn L. Martin Company. Among the many organizations to which Mr. Martin belonged were the I.A.S. (Benefactor and Founder Member), Aircraft Manufacturer's Assn. (Founder Member), the All-American Amateur Baseball Assn. (President), and Early Birds (Trustee).

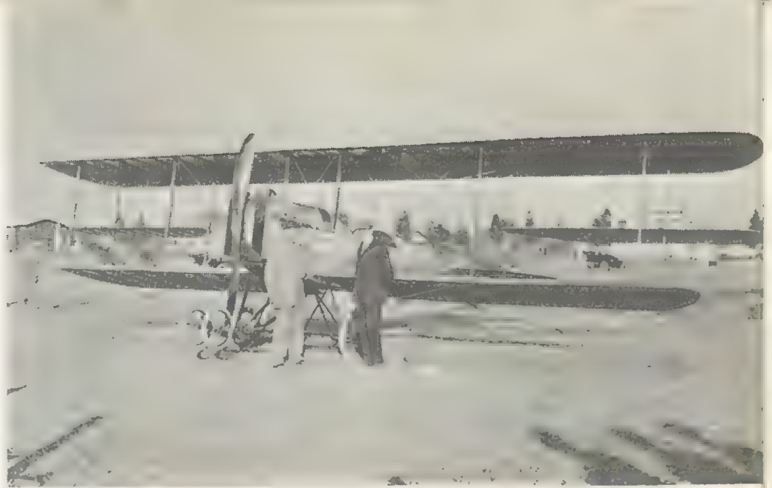
MINTA MARTIN AERONATICAL STUDENT FUND

An extremely close tie between Mrs. Minta Martin and her famous son, Glenn, was in evidence throughout their lives by a common interest in things aeronautical. She is shown in many of the photopraphs taken during the early days of his flying career, and in later years during the building of the giant company bearing his name. Her role of companion, advisor, confidante and mother is in the finest tradition.

Mrs. Martin's influence in the lives of other young people in aviation is being felt now after her passing, and his, through the establishment of the Minta Martin Student Fund. This fund was entrusted to The Institute of the Aeronautical Sciences. Its original endowment was $250,000 and later additions by Glenn Martin since his mother's death have increased it considerably. The proceeds of these sums are administered by an Advisory Board, participated in by the President and the Director of the I.A.S. Its purpose is to enable young men and women to study, travel to and from aeronautical events, and to enagge in the various competitions held each year for student engineers.

The Fund was officially dedicated at the National Summer Meeting of the I.A.S. in 1954. In commenting on the announcement, Glenn L. Martin stated, "The establishment of this fund is in keeping with the ideals of my late mother, Minta Martin, who from the beginning demonstrated a great interest in young people in aviation. By making this fund available to The Institute of the Aeronautical Sciences, its efforts in preparing the student engineer for his place in the aeronautical industry will be facilitated. It is my hope that this fund will benefit aeronautical students throughout our country for many years to come."

MARTIN WAS PICTURED HERE with other famous airmen; J. W. McClaskey, Lincoln Beachey, and H. C. Richardson in 1912. Martin's preparation for exhibitions, his speech and dress earned him the nickname, "The Dude." Dare-devil Beachey was killed in 1915 when his wings collapsed over San Francisco Bay. *Photo — Bodie*



THE FIRST MILITARY PLANE built by Martin was this training type with OX-2 engine of 90 h.p. Seventeen were procured by Signal Corps in 1914, competitive to Curtiss J models. Other pre-war Martin types for military were 6 S-hydroplanes, 2 R-types (land version of S) and 12 R's under Wright-Martin name. *Photo — Bodie*

THE CAREER OF GLENN L. MARTIN

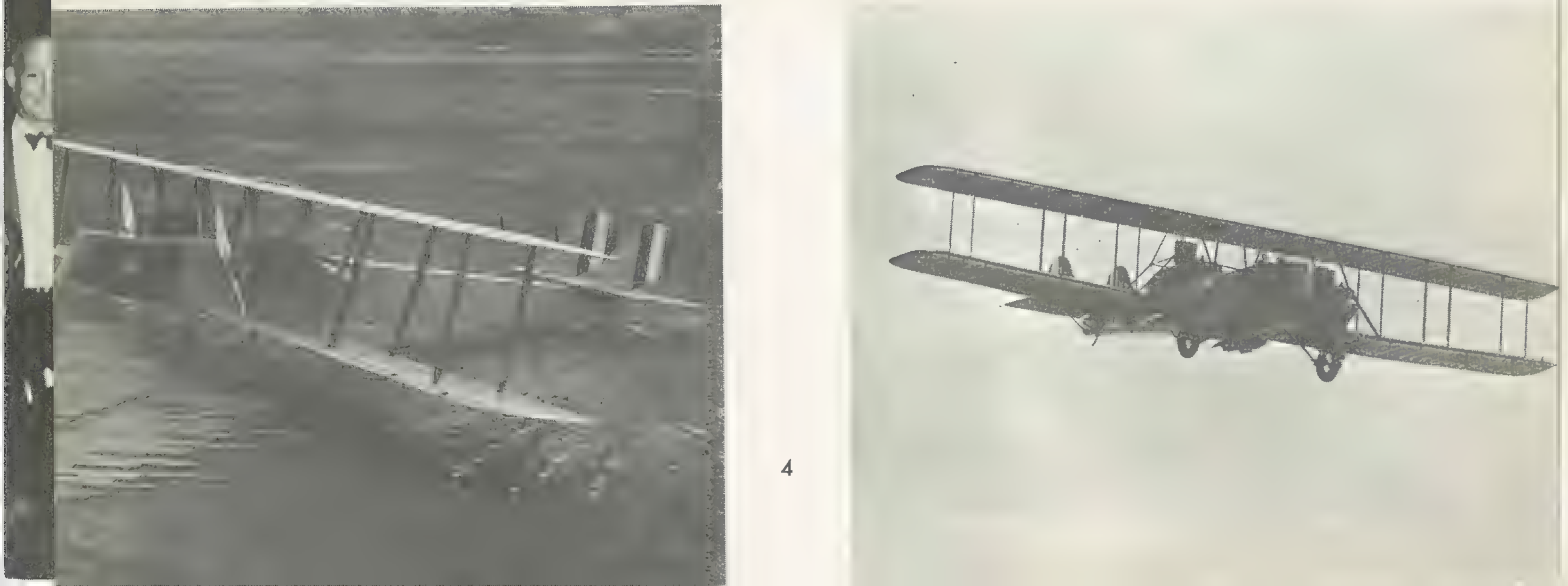
A combination of particular talents, great physical stamina, and business acumen enabled Glenn L. Martin to build into a lifetime accomplishments which span almost the entire age of flight. He began to fly in 1909, and died in 1956 at the age of seventy and during these years mankind, aided in no small way by Mr. Martin, took off into a new era.

When the Martin family moved to Santa Ana, California in 1905, young Glenn went to work as an auto mechanic. He quickly grasped the implications of this new manner of mechanical transportation already opening and soon opened his own shop, becoming very successful at selling Fords and Maxwells. But reports of the Wrights came and his vision leaped ahead to an even greater field, air transportation. He began to experiment with gliders, and then to construct a powered airplane. His first engine, a 12 h.p. Ford, was entirely too heavy. A 30 h.p. Eldridge was lightened as much as possible and when placed in his own hand-built flying machine, enabled his first cautious tries at aerial navigation.

His first flight was much like the Wright brothers'. No one could instruct him in the new art. A modicum of scientific data was behind his construction, but Martin was long on the practical application of mechanics. Recent successes of Curtiss led him to pattern his airplane in the form of current designs.

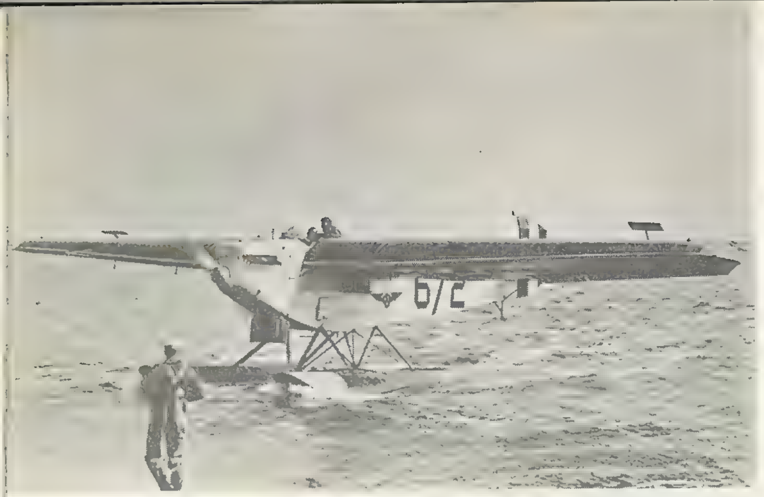
Martin actually flew for the first time on August 1, 1909. It was only a few yards in length, but daily he lengthened the hops until eventually he was hundreds of feet above the ground, circling in each direction and landing again. His observations of structure and performance were incorporated in changes made after each flight. Throughout the next several years this self-taught flyer, in machines of his own design, launched his aircraft business career with demonstration flights, exhibitions, publicity hops, instruction of other "sportsmen" and by every means possible to ensure success. In 1911, Martin toured the

MB-1 BECAME THE INSTRUMENT that proved Gen. Billy Mitchell right in his battle for airpower. In sinking ex-WWI German battleship "Ostfriesland" on July 20, 1921, Mitchell used 2000-lb. bombs dropped from 6000 feet. This defied orders to use light bombs from 10,000 feet, obstacles deliberately set to discredit him. Martin Bombers delivered the fatal blow to the battleship that day, confirmed the pattern for future warfare. Designed in 1918, the MB-1 was the basic concept of the twin-engined wood, steel and fabric biplane used by the Air Service until the Douglas XB-7 was designed in 1930. *Photos — L, Sherman Fairchild Collec.; R, W. M. Bodie*



GLENN L. MARTIN'S FIRST FLIGHT
August 1, 1909

The painting reproduced above depicting the event which marked the beginning of The Glenn L. Martin Company, is by the noted aviation artist Charles H. Hubbell. It was executed for the Thompson Products Company in 1941. The scene is near Santa Ana, Calif. The original painting now hangs on a wall in Mr. Martin's office.



ADVANCED IN DESIGN, D-12 powered MO-1 of 1922, shown here in early markings and insignia, had crew of three; made 100 m.p.h. Also was catapulted from barge in tests at N.A.F. SC, T3M and T4M series served at sea and ashore from 1926-36. T3M-2's of VT-1 were first to serve aboard carrier in operational status. *Photo—USN*

FIRST DIVE BOMBERS to carry 1000-lb. bomb, BM-1 and BM-2 were standard carrier equipment in mid-1930's. Landing gear was unusual; yoke threw bomb clear of the propeller. Last Martin carrier aircraft, post-WWII AM-1 was designed to carry 4000-lb. load, take off in only 400 feet. Heavier loads were carried. *Photo — USN*

Middle West and took in over $12,000.

In early 1912 Martin moved his business to Los Angeles and there constructed the hydroplane in which he flew, in May, to Catalina Island and back. It was a short hop of little over half an hour each way, but he claimed the attention of the entire West, and astutely pointed up the implications of this flight as having long range observation possibilities for the Navy. The Glenn L. Martin Company was incorporated in the fall of that year.

The trend in flying machine design turned toward the biplane tractor, and Martin followed suit. His "TT" Tractor was produced in 1913, looking like a truly modern airplane with a nose-wheel in front, double bay biplane wings and ailerons mounted between these in the manner of Glenn Curtiss. It was sold to the Army Signal Corps in 1914.

In the next three years the Martin Company grew in stature in the world of aviation. The war across the ocean occupied the attention and sales increased at a brisk pace. From all indications the United States was sure to become involved and expansion of all facilities became imperative. Glenn Martin's approach was typical of his leadership; he formed, with the Wright Company a new firm to take over all stock of the two firms and some others, called the Wright-Martin Company. It was a combination which should have created a giant of the industry, but the arrangement proved unsuitable to Martin and he pulled out shortly after.

In December, 1917, with the United States fully engaged in the war, the Glenn L. Martin Company was reestablished in Cleveland, Ohio. Martin was then thirty-one. He gathered men about him who later became the captains of the industry. Its first product was the MB-1, a remarkable machine for its time, which served the Air Service and Navy for many years after the war. From this auspicious start grew the giant firm which is today the oldest United States aircraft manufacturing concern in existence.

DESERT WARFARE was the special dish for most Martin Model 187 Baltimores. A British specification, stemming from their vast experience with the earlier Maryland, was the basis for its design. Although designated A-30 by the USAAF, most served with the RAF in Africa, the Middle East. *Photo — Martin*

ORIGINALLY ORDERED by the French, Martin 167 was first large World War II order received by Martin Co. Baltimore facilities were doubled and first production order was completed in a little over ten months. Designated Maryland Mk 1 by British, airplane was used extensively in Middle East. *Photo — USAF*

COVER STORY

The airplane on the cover was designated the XB-907 during test. Later as the XB-10 this design provided the basic configuration for Martin B-10 series bombers. One of the pioneer all-metal monoplane bomber designs, the B-10 did much to mold the USAF into a mobile striking force. A group of B-10's demonstrated their capability by a mass flight from Bolling Field to Alaska in the mid-thirties. Prototype was procured under Air Corps specification in 1933 and was powered by two Wright 675HP engines. Top speed was 207 mph, considered phenomenal for the period. *Photo — USAF*

THE CHINA CLIPPER opened a new aerial route to the Orient in 1934. On November 22 it took off from Alameda, California, carrying nearly a ton of mail and seventeen passengers. Seven days later, after stops at Hawaii, Wake and Guam, the "Clipper" landed in Manila. This flight was under the command of the late Capt. Edwin C. Musick who had obtained fame for his early exploration flights in preparation for this service. The Martin 130, a big airplane for its day, had a span of 130 feet, length of 90 feet seven inches, weighted 52,000 pounds, cruised at 165 m.p.h. *Photo — Carter*

BEAUTIFUL MARAUDER was startling in looks and performance when it appeared in the early Forties. A "hot pilot's" airplane, it served in most theaters of operations throughout the war. Early versions of the Model 179, such as the B-26 shown here, did not see combat. The B-26A model was the first of many to enter into battle, getting its baptism in the S-W Pacific. Equipped with torpedo racks, four Marauders in the Army's 69th Bomb Group attacked Adm. Nagumo's force in the Battle of Midway at deck level. One returned to Midway with more than 500 holes in it. *Photo — ARDC*

COURTNEY'S CORNER

By Frank T. Courtney

THE CINDERELLA UMBRELLA

Dreamers of the past have foretold, in one way or another, almost all of the achievements of modern aircraft. But I doubt if anyone ever foresaw the evolution of the parachute from a comparatively humble life-saver to a full-fledged partner in some of the airplane's most valuable work. Today whole armies, or even cities, can be moved. No part of the earth's surface is inaccessible simply because what the airplane can pickup, the parachute can put down.

Long before man was invented, Nature demonstrated the parachute principle in various useful forms. And many years before the airplane was invented, exhibition balloonists jumped over the side to thrill the cash customers who came to see whether the parachute would work, which it often did. So many people wonder why the early pilots, and especially the warrior pilots of World War I, didn't use parachutes.

Parachutes were, in fact, used throughout that war by observers in kite balloons. They were a prime necessity because of the monotonous regularity with which those bloated fire-bags were knocked off. But the airplanes of the day could not afford the weight and space of parachutes. In spite of the daily tragedies which parachutes could obviously have averted, few, if any, pilots would have sacrificed some of the meager performance of their aircraft for the "maybe" services of a parachute.

Near the end of the war a few cases occurred where Germans bailed out of combat--damaged airplanes, but this did not generate any widespread yearning for 'chutes. The principal result was a controversy over whether these fellows should be shot on the way down; the sporting mind said no, the military mind yes, and frequently it was the same mind.

Soon after the war adequate parachutes became available and airplanes could now well carry them. But there was no great boom in sales, since few pilots were enthused about stepping out into nothing with only blind faith in a patch of silk of questionable intentions. Airplanes they knew; parachutes, no.

Human cussedness has decreed that all safety devices shall be strongly recommended by everybody, and used by nobody except under compulsion. So the parachute never really came into general use, come as a life-saver, until military and other official bodies forced it on half-convinced air crews.

Today the parachute has become, almost suddenly, an aircraft in its own right, for in an increasingly wide range of essential services, the airplane can deliver the goods to a point in the sky, but only the parachute can deliver them to any given spot on the ground.

F.T.C.

Current Historical Affairs

The age of flight covers such a short span of time, dating from 1903, that people at large do not recognize the historical significance of contemporary pictures, books, documents and such other artifacts of this civilization. Surely, there have been lots of airplanes made, as there were lots of Model "T" Fords. But it is becoming increasingly difficult to find a Model "T". One awakens to the fact that what got underfoot yesterday disappeared and is no longer with us today.

Thus it is a delight to the areonautica collector to know that several groups and individuals are doing much to preserve the physical bodies of historically significant aircraft. It is to be hoped that such active demonstrations will instigate the re-discovery of other items and thus save from destruction, through ignorance of their value, the many photographs hidden in family albums, and the scrapbooks and other documents among private papers.

As Jack Canary pointed out in the Spring issue of "Aeronautica," old airplanes are difficult to preserve. Paul Mantz has, by astuteness and great energy, been able to rebuild many aircraft for motion pictures and thus establish these projects on a paying basis. Two Ryan "Broughams" were discovered, purchased, and rebuilt as replicas of the "Spirit of St. Louis" for the forthcoming film. A Standard biplane, Orenco, DeH-4M2, and Tiger Moth are currently being used, and a Lockheed "Orion" (N12222) and a "Vega" are being prepared for films.

For several years past the Historical Associates of the I.A.S. have been, on occasion, permitted to set up these planes for photographing. Fifty-five of the Los Angeles group showed up for this event, camera in hand, on Saturday, September 8, as seen below.

Several privately sponsored publications have appeared in recent years, covering only aviation history. Published by the dint of free labor, these are subscribed by members only and are therefore not intended for profit. Financial problems always hover in the offing, and advertising holds no promise since the circulation figures are relatively small. Two of these, however, are doing a magnificent job in spite of the handicaps, the "Journal of the American Historical Society" and "Air Britain Digest." These magazines are factual and timely, and each serves as the center of interest for a very widely scattered membership. Air Britain is the older, having been formed in 1948. It gives slightly greater emphasis to the aircraft recognition type of historian. The Journal of the AAHS was begun this year by a local group in Berkeley, California. As an organization paper it has done far more for its members than any other publication yet seen. Names, addresses, lines of aviation interest and collection needs are printed for each member. This serves to introduce them to each other and to enable the sharing of mutual interests. Sources of aviation data and well researched original articles have characterized its contents.

For Air Britain Digest, address the General Secretary, Air Britain, 318, Barking Road, London E.6. (14s Od/yr.) For the Journal, address the Membership Chairman, 3321 Betty Lane, Lafayette, California.

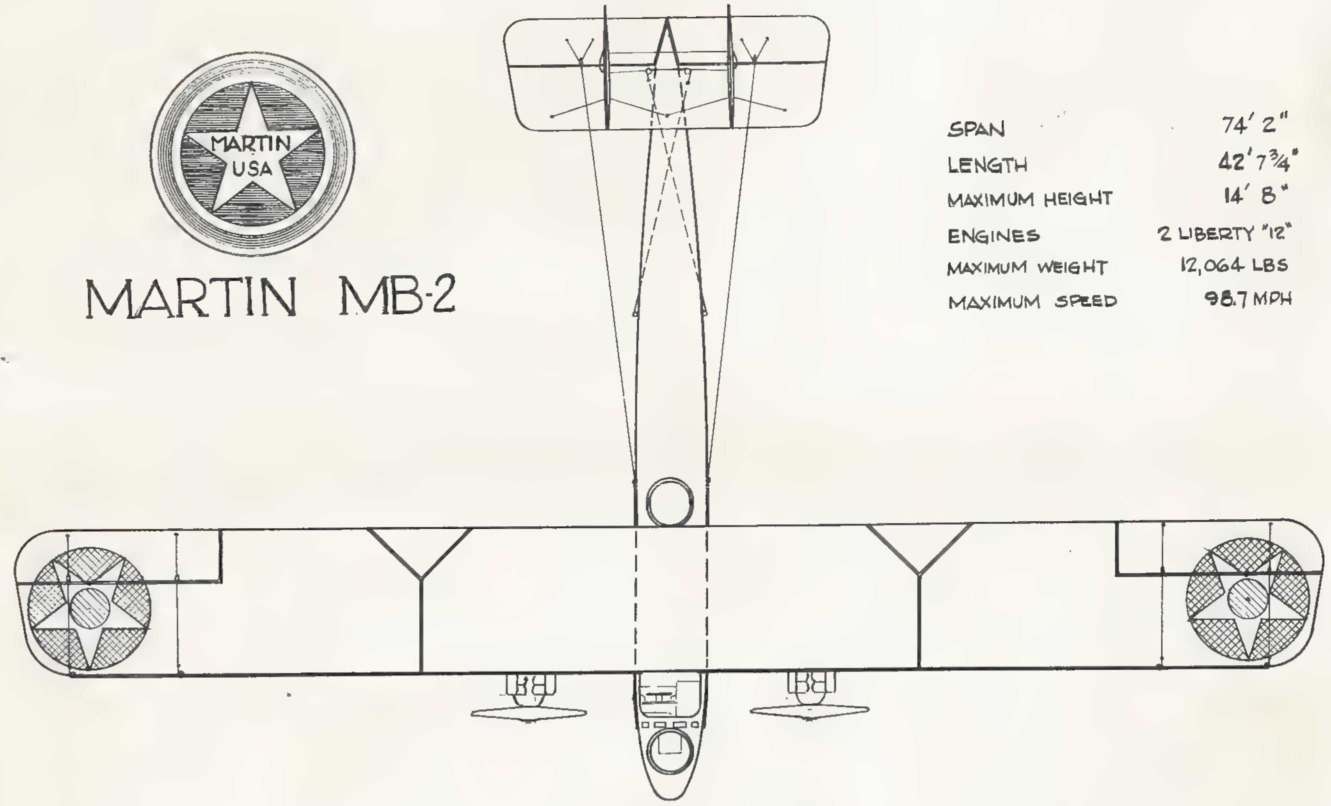
Plans are under way in San Diego, sponsored by the I.A.S. Section there, to build a replica of the Montgomery glider. Also a mural is being prepared for decoration of the lobby of the I.A.S. building, showing early events at Rockwell Field, North Island and nearby places.

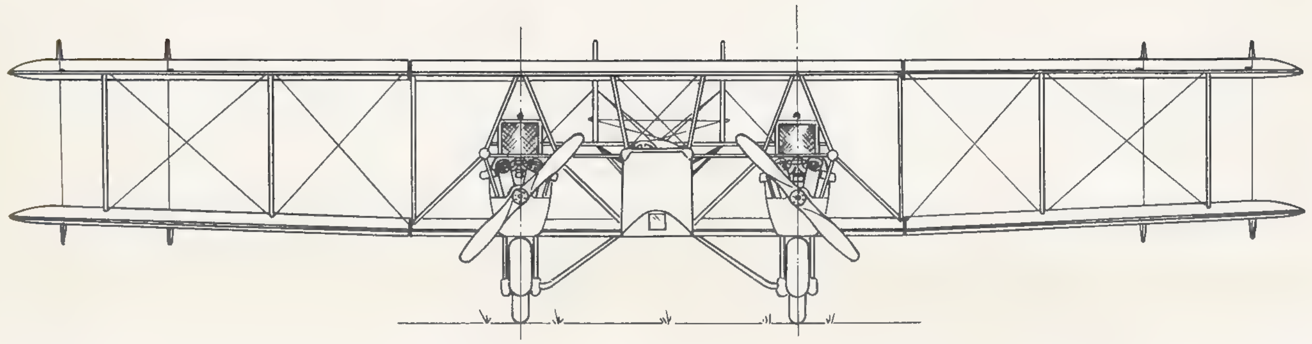
The Historical Branch in Los Angeles has merged its organization with the Los Angeles Section, I.A.S. and is now known as the Historical Committee. The Historical Associates had done valuable service in providing displays, arranging meetings, researching historical problems and the publishing of brochures for Summer Meetings. With the dissolution of the Historical Grade of membership, these personnel have assumed other grades of membership and an even closer tie is established with the Los Angeles Section.

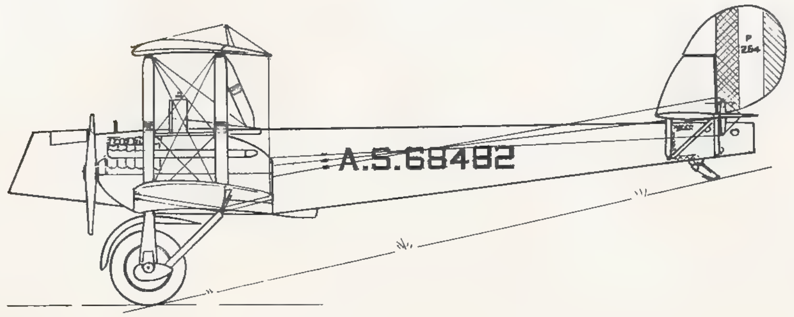
MARTIN
USA

MARTIN MB-2

SPAN	74′ 2″
LENGTH	42′ 7¾″
MAXIMUM HEIGHT	14′ 8″
ENGINES	2 LIBERTY "12"
MAXIMUM WEIGHT	12,064 LBS
MAXIMUM SPEED	98.7 MPH







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1956

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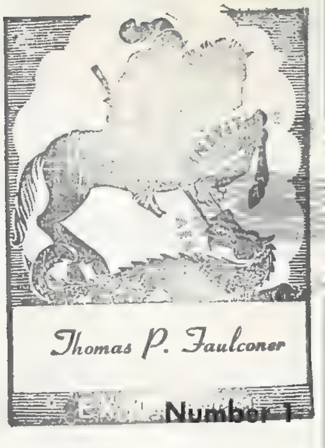

Thomas P. Faulconer

CONTENTS

FEATURES

New Feathers for a "Snipe" 2
Santos-Dumont No. 14 Bis 4
Fokker in the United States — Part 3 (Conclusion) 6

STAFF

J. J. Sloan, J. D. Canary, W. M. Bodie, June Preston

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EDITORIAL

This is the spring issue of an anticipated four issues for the year 1956. It is late in publication, which is to be regretted, but it is worthwhile to point out that all the editorial effort expended on AERONAUTICA is given freely by Los Angeles members of the IAS. These are busy times in a busy industry and spare time for the layout, editorial work and photograph selection is hard to come by. This statement is not intended as an apology but merely to remind all our readers that the organization and publishing of AERONAUTICA is accomplished entirely by volunteer help. Comments from readers is solicited and correspondence should be addressed to the Western Regional Headquarters of the IAS, attn: The Editors of Aeronautica.

Our next issue will be devoted to the memory of Glenn L. Martin, an aviation pioneer, who died recently. His contributions to the science of aeronautics are numerous and it is our intention to review his accomplishments pictorially and editorially in a manner which will remind all of us of the heritage which such pioneers have left for this and future generations to develop upon. Be on the lookout for this issue, dated Summer, 1956.

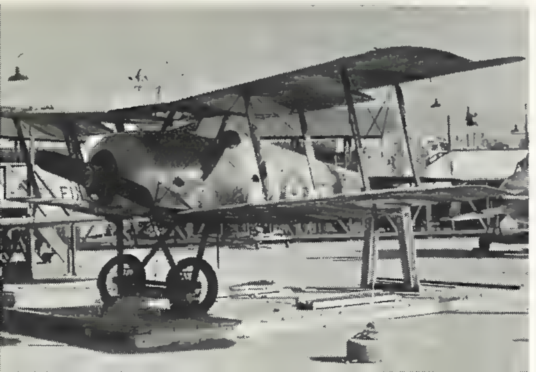
NEW FEATHERS FOR A "SNIPE"

By

JACK D. CANARY

PHOTOS (AND OTHER THINGS) COURTESY OF NORTH AMERICAN AVIATION

The trim little biplane sat perkily by the hangar door as painters put the finishing touches on the various insignias and marking. The works manager of the Ruston Proctor Co. approached with the records for the plane and handed them to the painters, then watched carefully as they applied the numbers "E-6938" to the sides of the fuselage. "Well," he said, "That's number two for us, soon we will be really rolling with this 'Snipe' contract. The boys are looking forward to getting this speedy little fighter and are waiting now for number two."



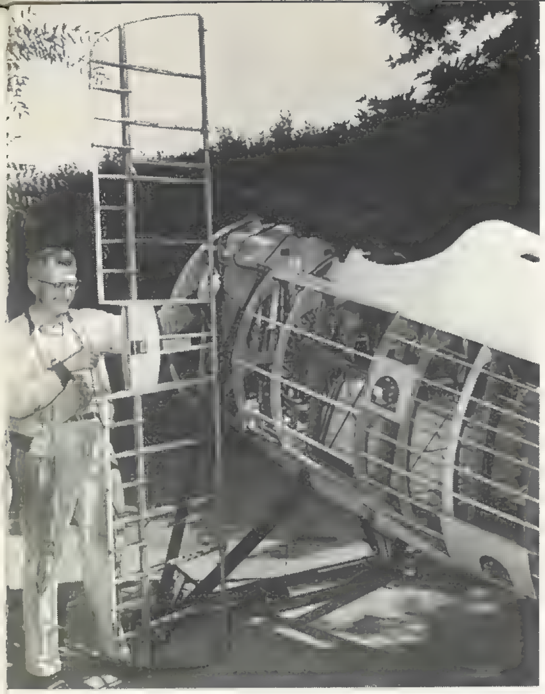
Hardly had the paint dried when No. E-6938 was pushed out into the light of day and prepared for it's flight to the Royal Air Force Testing Station at Farnborough. Born under the watchful eye of T. O. M. Sopwith as the Royal Air Force's answer to the Fokker D-7 and D-8, these "Snipes" were flowing into the squadrons of the RAF in ever increasing quantities. They were powerful, fast climbing, delightfully sensitive aircraft. Armed with two Vickers machine guns they were to provide the RAF with one of it's finest fighters of the great war. The date was September 20, 1918.

On September 22, 1918 the second production "Snipe" 7F-1 Serial No. E-6938 was accepted from the Ruston Proctor Co. and assigned to armament tests at Farnborough.

Today, July 10, 1956, "Snipe" Serial number "E-6938" is about to leave the hangar again. The place is not Farnborough but Southern California in the United States of America. How did this veteran survive all these years and what brought it halfway across the world into the hands of Jack Canary? Well, that's a long story in itself and will be told at the proper time and place. At any event the fact remains that it did survive, it is still with us and will soon be completely rebuilt exactly as it was in that far off September day in 1918.

Space does not allow a complete description of the work involved in giving this old veteran new feathers, but some interesting highlights of this project are described for the benefit of those many enthusiasts who have often dreamed of tackling such a job.

First of all, and most important, the aircraft was found to have been heavily modified by its previous owners and little trace of its original configuration could be found in what was left of the aircraft. This was a mild understatement too, as it turned out, for many valuable pieces of the airframe and engine were found to be missing as an inventory of the remains was made. Thus the first chore facing me in the process of rebuilding old E-6938 was that of determining the exact original details of the aircraft in those areas that had been modified and then start the search for the missing parts. In some cases, as one could well imagine, the search was fruitless and thus design and manufacture of new parts was required.

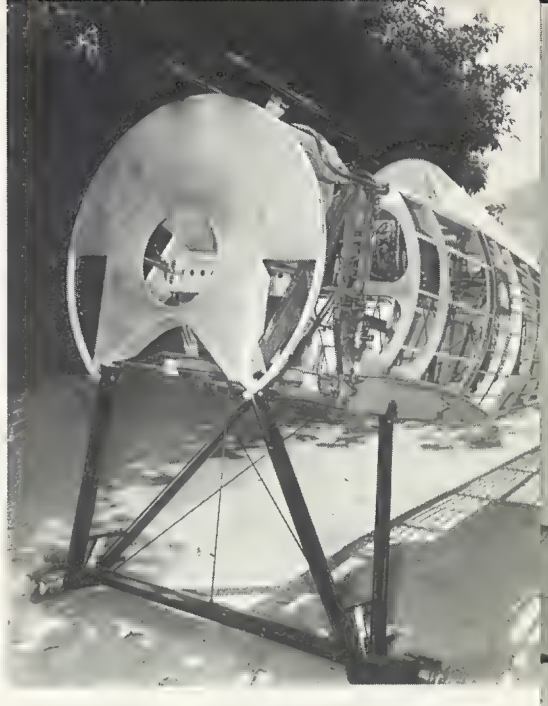


Starting in September of 1953, I completely disassembled the plane with the help of fellow members of the IAS and during the year 1954 spent most of my time cleaning, repairing, or replacing those parts which I already had. At the same time a ream of correspondence was begun in this country and in England to pry out the needed data on rigging, cockpit details, instruments, armament installation, engine and propeller.

During 1955 information slowly began flowing in as the reassembly of the airframe proceeded. Certain items, like the propeller, were completely nonexistent and thus several months were spent in studying the design of wooden airscrews; then with fingers crossed, proceeding to design from scratch the needed propeller. Further months were spent in submittal of the drawings to the few firms still in the business and finally the thrill of contacting one who would do the job.

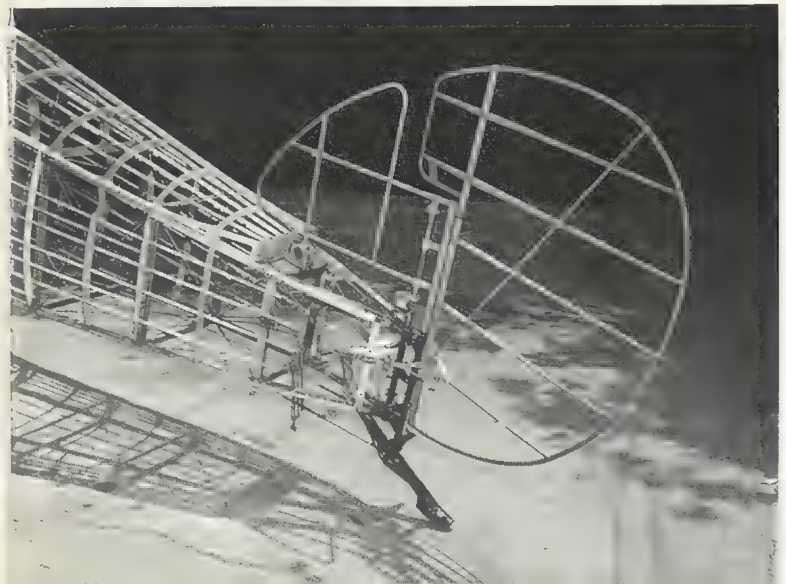
So it went with each component of this little monster, as it sometimes seemed to be. Neither magneto for the engine was available in 1953. Now two magnetos of the exact type are in process of rebuilding in England by the firm which bought out the original producers in 1919. This hunt was the result of help from such old timers as Frank Courtney who was instrumental in locating the designer of the PLM magneto. The Bentley BR-2 rotary engine was found to be in overhaulable condition but lacked many parts and needed much rebushing and repair work. A photograph of some of the major engine components is shown during the overhaul period. At present the engine is completely reassembled and installed in the fuselage. It is runable and is entirely airworthy.

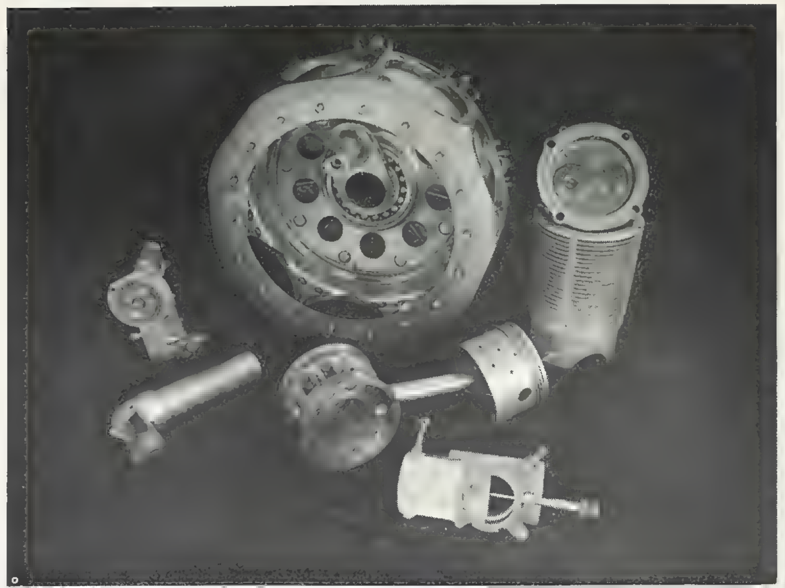
Much data was desired on the instrument panel and instruments. Contact with the Smith and Sons Co. in London produced original drawings of the instruments used in the production aircraft. From these drawings accurate reproductions have been made which are completely operable and authentic. And so it goes as the little beauty nears completion. The Flightex Co. generously donated fabric for the entire aircraft. The Northrop Aeronautical Institute completely rebuilt and recovered all four wing panels. Other local IAS members such as John Sloan, Dustin Carter and Warren Bodie have contributed of their time to help this wonderful little creation of a bygone era grow its new set of feathers.



The Dunlop Tyre and Rubber Co. in England have re-rimmed the graceful wire wheels and installed smooth contour tires of the exact size of the originals. Countless other individuals and groups have contributed to this program in a heartwarming manner. In the near future I will have the same pleasure as that painter back in 1918 when I stencil on each side of the fuselage "E-6938." This pleasure will be full payment for a very enjoyable experience.

Many people say, "What's the good of all that work and effort on that old wreck?" In answer I say that such work and effort is required of some people in order to preserve for present and future generations the examples of engineering talent and workmanship that pioneers in the field of aviation have willed us. This is our excuse for existence, we historians; I think it's time and effort well spent; how about you?

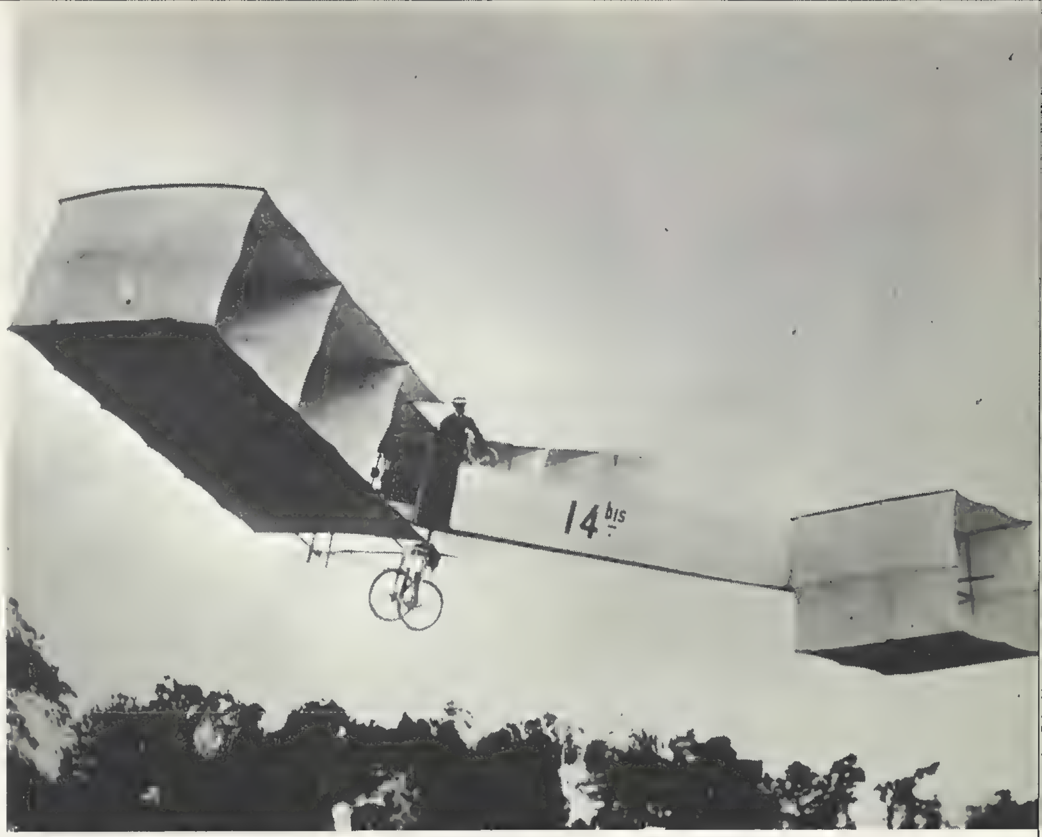




SANTOS-DUMONT ''HARGRAVE''

NO. 14 bis

BY GEORGE LAWLOR

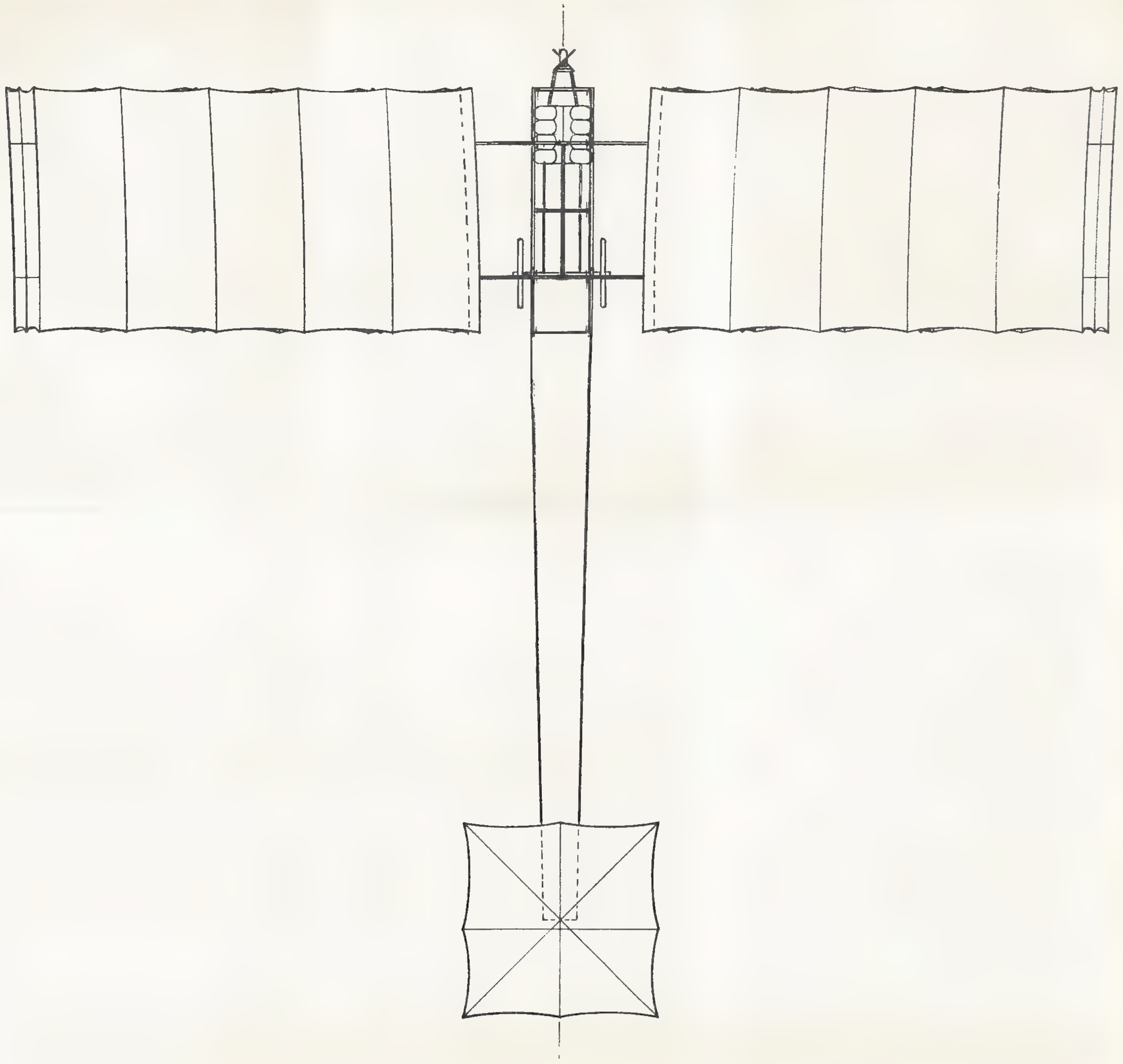


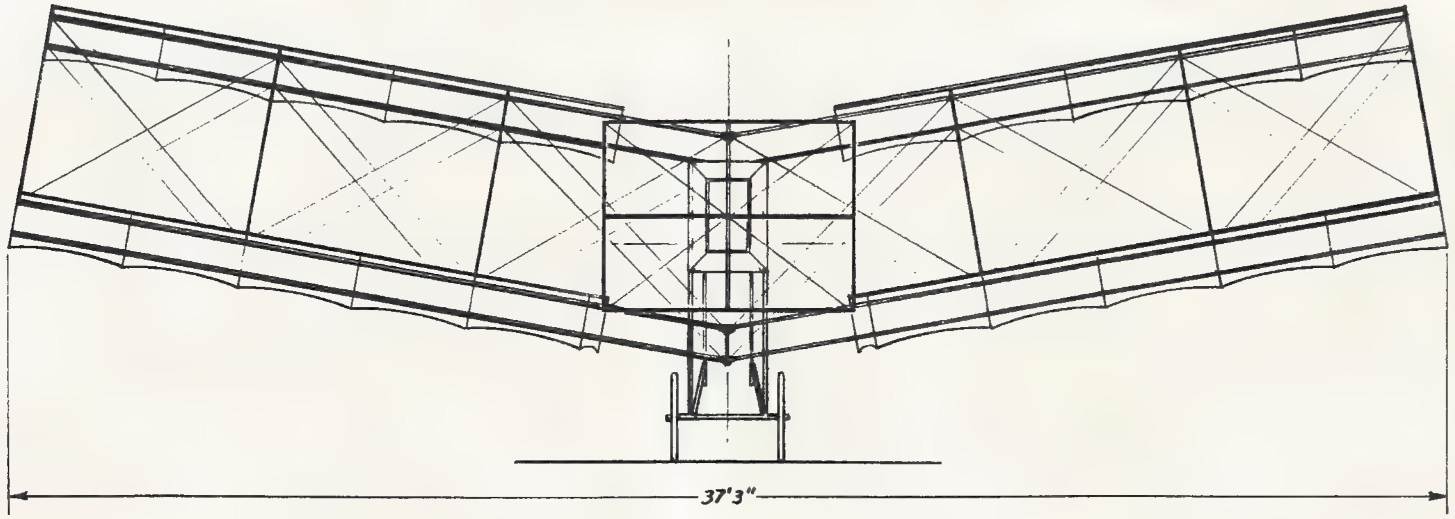
"Santos-Dumont, thereupon, built an aeroplane which was really an elaboration of the Hargrave, or "box" kite, with a motor. This new machine was called the "14 bis." It was exhibited to the French Aero Club on July 1906. The planes were of silk stretched over bamboo, and they had a total area of 237 square feet. The contrivance was smashed in one of its early trials, and Santos-Dumont immediately set to work to build an improved machine, with which he soon succeeded in flying a distance of 200 feet. It is worthy of remark that in his earliest trials with the flying machine Santos-Dumont was reluctant to dispense altogether with his old friend the airship, and he attached his new machine to one of his recent balloons. This, however, proved to be a hindrance rather than a help. His first actual ascent into the air on a heavier-than-air machine was made with the aid of an inclined wooden frame down which the machine ran until it gathered speed with its motor working sufficiently to give it lifting power.

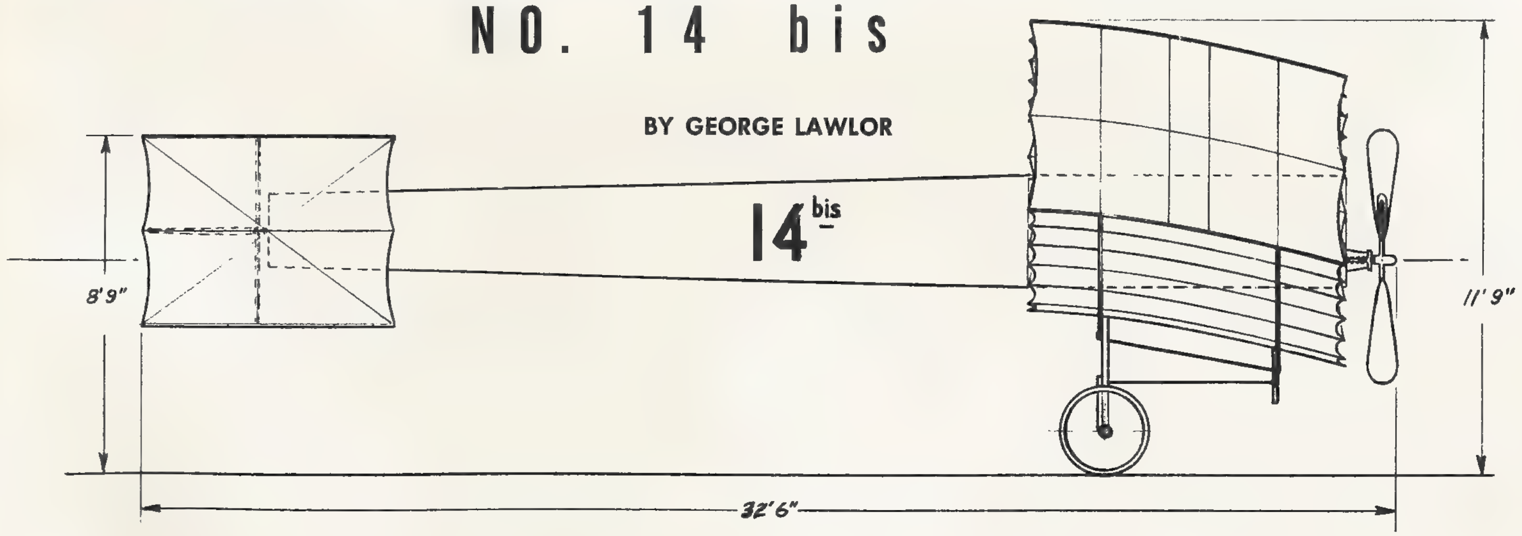
Improvement followed improvement. The motor was changed for one of 50 h.p. and the two rear wheels of the undercarriage were discarded. On the 23rd of October 1906, Santos-Dumont won the Deutsch-Archdeacon Cup for a flight of not less than 25 metres. He actually flew much farther, but the officials of the French Aero Club became so excited when they saw the machine was actually flying that they omitted to measure the distance accurately. In descending, the front wheels of the carriage of the machine were broken, a mishap that occurred through the pilot shutting off the engine while in the air and coming down to the ground rather heavily.

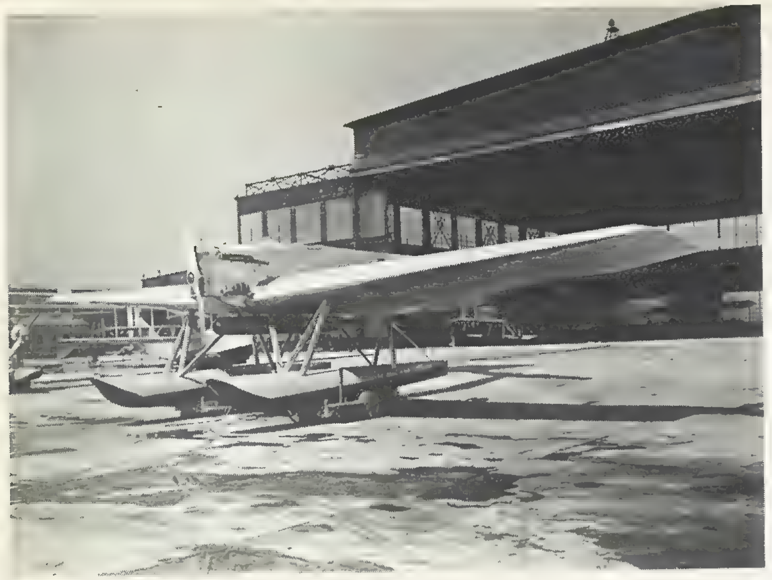
A month later Santos-Dumont made a flight of 220 metres, his achievement being hailed in French aeronautical circles with tremendous enthusiasm, although the general public quite failed to grasp the significance of the feat and only credited the aviator with a few lucky long hops. At the time this was supposed to be the first ascent in a flying machine in Europe, the work of Ader not being recognized. This flight, November 12th, 1906, established the first official world's speed record at 25.66 miles per hour."

The above quotation is from "The Romance of Aeronautics" by Charles C. Turner.

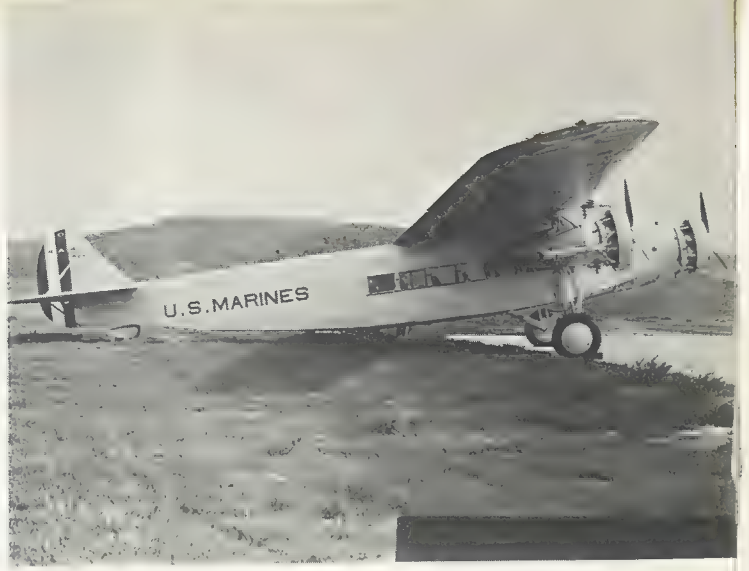








FT6 WAS ONE OF FEW FOKKER planes sold to U. S. Navy in mid-twenties. Note typical Fokker plywood wing, with balanced aileron, torpedo under fuselage. Engine, "Liberty", used Lamblin type oil cooler. In background are VE-7 floatplane, HS-2L, TD-1, F5L. *Photo: U.S. Navy No. 432808, Negative No. 34134.*



RA-4 BUILT FOR U. S. MARINES was same design as commercial F-10A. Marines used several in Nicaragua campaign in 1929, supplying troops fighting Sandino's rebels. This one was modernized at newly opened Fokker plant at Wheeling, W. Va. with new longer engine mounts, latest in radio, tail wheel, night lights.

Fokker IN THE UNITED STATES

PART 3

BY JOHN SLOAN

In 1926 there began what is now claimed to be the oldest American commercial airline, Western Air Express. In common with other carriers, the line was brought into being to transport airmail. As previously pointed out, one would have thought that passenger traffic would start early in the U. S. and spread to other parts of the world, because of its great distances. But public apathy made this slow to come about until passage of the Kelly Bill or Air Mail Act of 1925 gave the green light to commercial air mail routes contracted between the Post Office and private operators and thus paved the way for eventual passenger service.

Western Air Express was organized in July 1925, put in its bid for Air Mail Route 4 in October, and began carrying air mail between Los Angeles and Salt Lake City on April 17, 1926. It earned a profit almost immediately. In 1927 the Daniel Guggenheim Fund for the Promotion of Aeronautics lent the money to Western for the purchase of three Fokker Trimotor F-10's. The object was to further the progress of civil air transportation through the establishment of a model air line, and Western was chosen as the vehicle for this idea. The Fund bore the expense of setting up an ideal weather service in accord with the new meteorological principles depeloped in Scandinavia, and brought Dr. Carl Rossby to the U. S. from Norway to direct it.

The Fokker Trimotor at that time was a really superb airplane. Twelve passengers were carried in what is described as luxurious comfort. There was a crew of two, and a lavatory. At $60,000 each, Fokker made a wonderful success of this model, selling F-10's and F-10A's to (beside PAA and WAE) Universal Air Lines, Richfield Oil Company, U. S. Navy, Army Air Corps, Rio Grande Oil and Shell Oil Companies.

F-10A WAS FINEST of Fokker Trimotors. Consistent publicity in U. S. kept the Trimotor in the limelight from 1925 to 1931 beginning with the Ford Reliability Tour and ending with the Rockne incident. Excellence of craftsmanship was the pride of the Fokker company, evidenced by cowl work around engines. *Photo—N.A.A.*

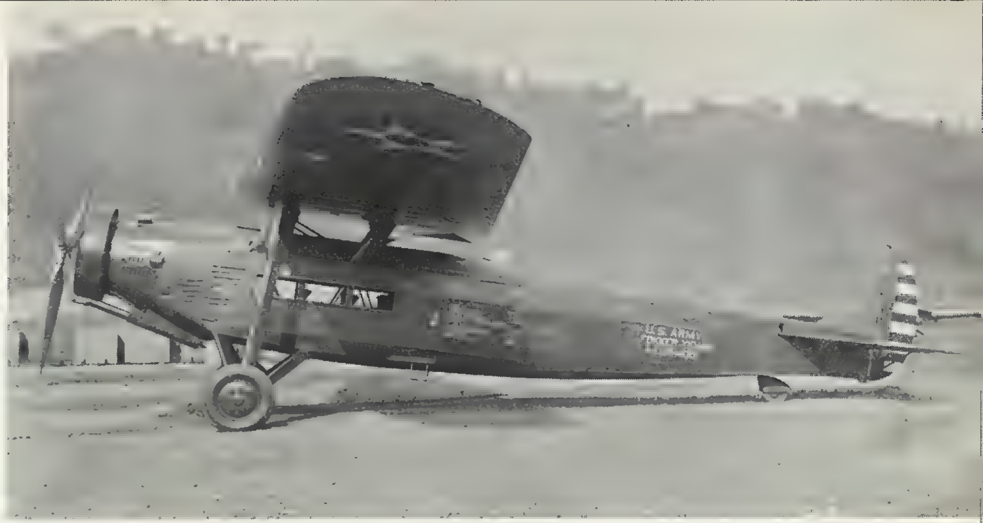
SUPER-UNIVERSAL became favorite of "bush" pilots and feeder airlines for its handling and weight carrying ability. Western Canada Airways used many, both land and floatplanes, in supply operations to inaccessible spots in the North. Adm. Byrd used one, "The Virginia", in his South Polar work in 1928. *Photo — N.A.A.*

To digress for a moment, let us consider other aircraft orders which were bringing Fokker Aircraft Company to being the largest airplane factory in the world at its time. The Super-Universal was a single engined "Wasp" powered monoplane of six-passenger capacity. Many of these were made for the burgeoning feeder air lines and for special use by executives and for research. Users included Standard Air Lines, Colonial Air Transport, St. Tamany and Gulf Coast Airways, Goodyear, RCA, Deep Rock, Radio Frequency Labs and many others.

From the Witteman-Lewis plant at Teterboro Airport in 1924, Fokker expanded into another one close by at Hasbrouck Heights, New Jersey. In 1928 further growth included a site at Wheeling, W. Va. Until the mass production of Universals and Super-Universals began in 1927 no actual wing construction was done by Fokker in this country. All wings had been made in Amsterdam and shipped to the U. S. The training of American craftsmen became imperative as the orders grew larger. The most advanced wood working equipment was installed, including the forerunner of the modern spar mill. Many glueing, sub-assembly and assembly fixtures were provided, assembly operations were stationized and an orderly production control system instituted.

With expansion there came specialization. The Teterboro hangar became the experimental and modification department, Hasbrouck Heights became wing assembly and Wheeling became fuselage and final assembly. For its day, the peacetime years of the late Twenties, Fokker Aircraft was the largest in the world not including Netherlands Fokker Company.

Throughout 1929 the tempo of manufacture was increased at all plants, with no new designs but with custom building and modification of Trimotors and Super-Universals for a long list of customers. Then 1930 brought the last of the Fokker Transports to be designed and built in the United States, the F-32. Ten of these were built, five each for Western Air Express and Universal Air Lines. One of the first, a part of the WAE batch, was tested by the Air Corps as the YC-20, but not purchased by them. The F-32 had its "bugs" and the worst, rear engine cooling, remained a problem to the end. They were used but a comparatively short time and discarded by the air lines after 1931.



Y1C-14A shown above was last of 20 Y1C-14's sold to U. S. Army. One other was modified into ambulance plane as Y1C-15. The design was made for Western Air Express and known as the commercial F-14. It was eliminated from airline passenger service after 1932 by Dept. of Commerce ruling requiring two or more engines. *Photo — N.A.A.*

The year 1931 became the fateful year for Anthony H. G. Fokker in the United States. On Feb. 13th the final details of the merger of Western Air Express, Transcontinental Air Transport, and Pittsburgh Aviation Industries Corp. were completed to form Transcontinental & Western Air, Inc. These had been the chief outlet for the Fokker Trimotor product. The General Motors Corporation bought the controlling interest in the Fokker Aircraft Corporation of America . . . and a TWA plane crashed, killing all on board.

(Headline—New York Times, Wed., April 1st, 1931:)

"KNUTE ROCKNE DIES WITH 7 OTHERS IN MAIL PLANE DIVE

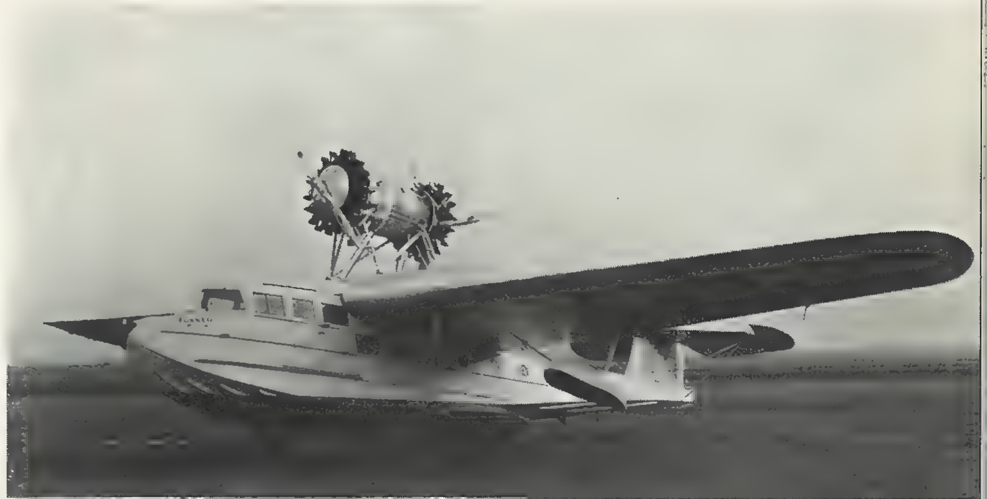
"At 11:00 A.M. this morning a Transcontinental and Western Air Lines plane dived into a pasture in the Flint Hills cattle country near Bazaar in Southeastern Kansas. Among those dead is Knute Rockne, coach of the famous Notre Dame football team . . ."

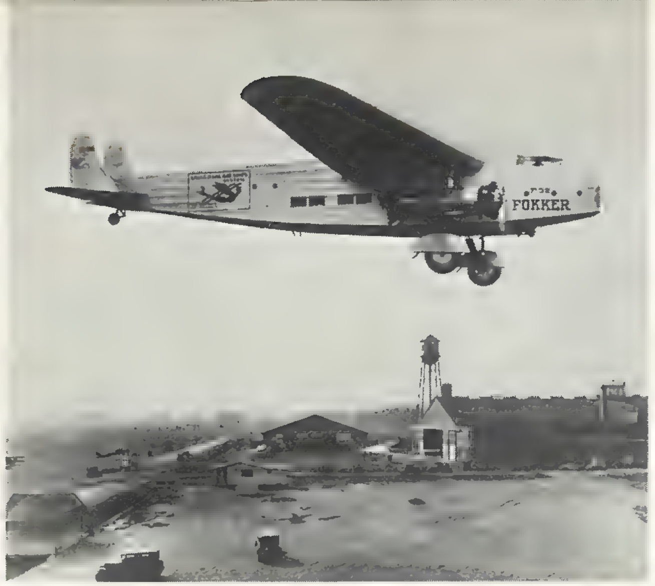
This dramatic event was front page news for seven consecutive days following the crash. Knute Rockne's fame and connections brought the story from the front page to the sports page, the drama page, and the society and women's pages over a period of almost two solid months in the nation's major newspapers.

This crash spelled the end for tne Fokker transports. A few of the F-10's and Super-U's hung on for a few years, passing into the hands of small operators.

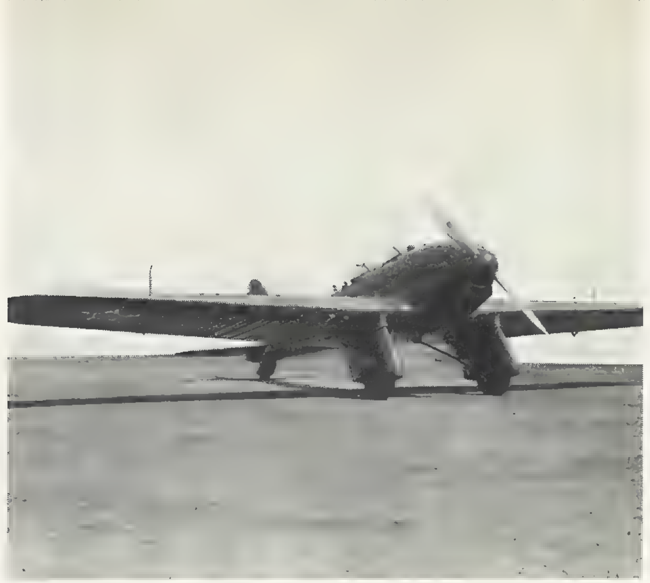
In the change to General Aviation Corp. in 1931 Anthony Fokker remained as Chief Engineer and as a Director of

F-11A FLYING BOAT was intended as luxurious private air yacht. Several were sold, one to Gar Wood, famous speed boat racer. This model had two engines, others had but one. The design was modified with two engines in side by side nacelles and several were sold to the U. S. Coast Guard as General Aviation Model GA-15. *Photo — N.A.A.*





F-32 WAS LAST OF Tony Fokker's commercial designs made in the U. S. View above shows Fokker experimental hangar at Teterboro, N. J. where Barling Bomber had been built. In background are Navy "Universal" and Trimotor later sold to Shell Oil Co. F-32's were discarded after 1931. One became gas station. *Photo — N.A.A.*



FOKKER CALLED XA-7 his worst headache. It came at a time requiring switch to all metal construction, had typical Fokker thick tapered wing made from steel and aluminum instead of plywood. It was built to same specification as moderately successful Curtiss A-8. Cooling of engine hampered performance. *Photo — N.A.A.*

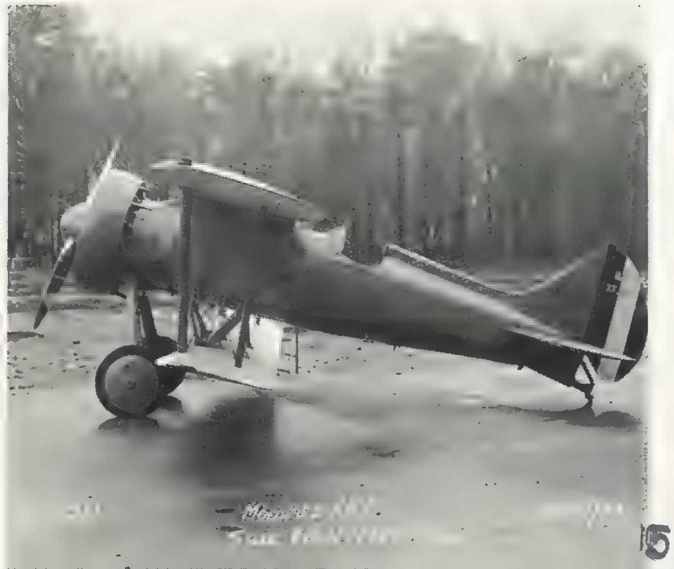
the Corporation. But the personal touch was lost in the designs which followed. The AF-11 amphibian of which he was so proud was followed by a similar twin engined pusher amphibian for the Coast Guard, the FLB-55. The line of the XLB-2 is traceable into the XO-27, later accepted into the Air Corps as the YO-27, and one of these became the XB-8. The XA-7 never went beyond the experimental stage. But Fokker's personal fortune was by this time considerably larger than ever before and as he withdrew from General Aviation he found other outlets for his tremendous energies.

He acquired the European selling rights for the Douglas DC-2 airplanes and was in and out of the United States every few months until his death. The citizenship papers which he initiated in 1931 were not completed because he was not in the country for a consecutive six months as required by law. General Aviation, which obtained the physical assets of the Fokker Corp., itself went out of business in 1934 when North American Aviation, Inc. became a manufacturing concern instead of a holding company for several varied aircraft interests including Eastern Air Lines.

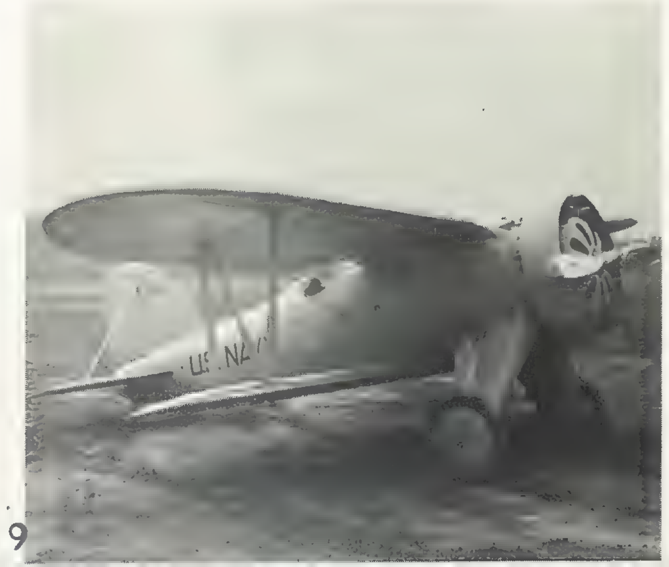
Anthony Fokker was in the United States when he died. After his passing U.S. Air Services magazine wrote of him as follows, in 1940 . . .

"One of the most versatile men in world aviation was Anthony Fokker — Tony to all who knew him — who died on Saturday morning, December 23rd (1939), at Murray Hill Hospital in New York City, where he had been ill of pneumococcous menengitis for three weeks. General Mason Patrick, Chief of the Air Corps at the time of Fokker's most memorable feats paid this tribute: 'Ordinary rules did not apply to him,' said Gen. Patrick. 'You can't confine genius, and Fokker was a genius'." END

NORTH AMERICAN AVIATION was formed in 1928 as a holding company for aviation stocks, acquired General Aviation (Fokker) and Berliner-Joyce Aircraft during Depression. Shown here is XFJ-1 made for Navy by B/J in 1931. N.A.A. became manufacturing concern in 1934. Postwar FJ-1 was its first jet-plane. *Photo — N.A.A.*



GENERAL AVIATION went after Navy business with the XFA-1 in 1932. Other military orders were obtained for XO-27, XB-8, PJ-1. Its GA-43 was an unsuccessful attempt at commercial transport field. Another design, twin-engined GA-38, did not progress past mock-up. Assets of the company went to NAA. *Photo — N.A.A.*



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FALL-WINTER
1956

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CONTENTS

Volume 8 **Numbers 3 and 4**

FEATURES

Air Museum Comes to West Coast 2
Evolution of the Boeing P-12 F-4B Fighters 3
The Structural Engineering Practice of the Wright Brothers 4
Wright Airplanes, 1903-1911 7
Japanese Aircraft 10
Ki-87 Three-View 12
F4B-2 Three-View 16

STAFF

R. L. Bliss, D. W. Carter, R. B. Johnston, R. B. Oakley, June Preston, J. J. Sloan

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AIR MUSEUM COMES TO WEST COAST

By

Ralph B. Oakley

For 15 years Ed Maloney of Claremont, California has been collecting Aeronautica. During World War II he obtained a spark plug from a Japanese "Zero" fighter. His largest item today is a complete Boeing P-12 fighter.

To house the exhibits, in January Maloney opened California's first aeronautical exhibit, the Air Museum, at 915 East Foothill Boulevard, Claremont.

The Museum's most prized possession is the original Hanriot HD-1 Scout used by Capt. Charles Nungesser, the French double ace of World War I fame.

It wasn't until late last year that Maloney was able to lease an abandoned warehouse where he could display the exhibits. The biggest renovating job was the construction of a seven foot wall of corrugated aluminum around the sides of the building. When this was completed, Maloney started the task of moving in the exhibits and assemblying them for display.

Among the other aircraft in the museum is a Japanese "Baka" bomb, probably the most unique fighting aircraft ever actually used in combat. The aircraft is not much more than an elongated bomb, with small stubby wings, a rocket power plant and a tiny cockpit. Japanese pilots who flew these tiny one-way aircraft were quite successful against American battleships and aircraft carriers during the Pacific war.

Most museums are dynamic institutions, with constant expansion and changes of displays. The Air Museum is no exception. Among the aircraft now being restored for future display are many from both the Allied and enemy fighting powers. A P-40, P-47 and P-51 are now being readied, as well as a Japanese Ki-84 "Frank" fighter and a German Messerschmitt Me-262A jet fighter.

A Boeing P-12E fighter, pride of the U. S. Air Service during the early 30's is one of the Museum's most historically significant exhibits.

While the Air Museum features military aircraft, other aircraft are not neglected. A full scale replica of Octave Chanute's biplane glider is on display. Most air enthusiasts know that Chanute conducted numerous glider experiments in the sand dunes near the southern end of Lake Michigan in the 1890's.

Most of the work in connection with the acquisition and restoration of the exhibits has been done by Maloney single-handed, during his spare hours from his regular job. In addition to the Museum work, Maloney has been one of the most frequent contributors of papers at the IAS Historical Programs.

We hear frequent comments that there should be a worthwhile aeronautical museum on the West Coast. Everyone agrees, but Maloney is the only one to date who has been able to do anything about it.

We wish him much success.

Shown in foreground is the Hanriot HD-1 flown by French ace Nungesser. Museum displays include a historical set of models depicting the evolution of the U. S. Air Force.

EVOLUTION OF THE BOEING P-12-F-4B FIGHTERS

By

Edward T. Maloney

"One of the most maneuverable airplanes ever built," is the accolade given by service pilots to the P-12-F4B fighter series. These airplanes reigned supreme in their class until the biplane flighter formula was gradually phased out just prior to World War II.

The evolution of the series began in 1922. At the close of World War I, the Boeing Aircraft Company had contracted with the Air Corps to manufacture the Thomas Morse designed MB 3 fighter. With fighter production experience behind them, the Boeing Company then undertook the development of a pursuit airplane of their own design, the PW-9. The PW-9 (pursuit watercooled) was powered by Curtiss D-12 engine of 435 hp and first flew in 1923. The design featured an underslung sloping core radiator with small fuselage frontal area, and an elliptical lower wing and tapered upper wing. Subsequent flight testing with this configuration resulted in a production order.

The success of the PW-9 initiated the XP-4 design of 1927 which was an experimental high altitude fighter. Another experimental model of the same period was the XP-7 which was a PW-9 with a different engine installation.

The XP-8 was another Boeing experimental ship incorporating a number of PW-9 design features. It was the only pursuit at that time to use the inverted Packard engine, and was for a time the fastest single seat pursuit in service. Shortly after this, the Boeing Company developed the XP-9. It was the first all-metal stressed skin monoplane in pursuit aviation. Fuselage construction was much like the later Boeing P-12E, being all metal semi-monocoque design, while the tail was of corrugated dural sheet.

This geneology also continued in the Navy developed PW-9 counterpart, the Boeing FB-1, 2, and 3 Fighters. Experiments were conducted with regards to engine changes and minor airframe modifications. This development ultimately led to the FB-5 fighter produced during 1926-27.

At this point the Navy turned away from water-cooled engines and subsequent Navy fighters built featured radial air-cooled engines.

In 1926 the Boeing F2B-1 Fighter was developed and this featured the more popular radial engine. Three of these fighters became famous from coast to coast for they were flown by the "Three Sea Hawks" a famous Navy precision stunt flying team of the late 1920's. This design led ultimately to the F3B-1 Fighter. It was essentially the same type of construction but incorporated a number of modifications. It also used the P&W Radial Engine.

These designs were the forerunners of the famous Boeing P-12 — F4B Fighters.

Boeing Models No. 83 and No. 89 were the basic prototypes that ushered in the series of Boeing Army and Navy fighters. Both models No. 83 and 89 were Navy designated Boeing XF4B-1 Fighters. They differed in that the later model carried a 500 lb. bomb. The XF4B-1 was first delivered in July 1928 and first flew August 7, 1928. This high performance fighter was built at Boeing's expense, and was demonstrated to both Army and Navy. It was placed into production as the Boeing No. 99 for the Navy F4B-1 series and Model No. 102 for the Army P-12 series. Both designs were lighter, smaller and cleaner airplane than any of its predecessors; featuring high performance, improved maneuverability and better safety factors.

The F4B series were the forerunners of the modern carrier fighters. The P-12's and F4B's were the first single seat fighters capable of executing all fighting maneuvers fully loaded, and this included outside loops. How many military fighters of today can claim this distinction?

In this series streamlining was improved and this new fighter was exceptionally fast for its day, was extremely maneuverable (a good point that pilots who flew them never forgot), was sturdy and very stable making for a good gun platform. It was a favorite with pilots and described as a dream to fly. It responded quickly to every pilot's wish. They were easy to take off and land, had wonderful handling characteristics, and were easily recovered in a spin. In fact, they were the most maneuverable pursuit in the Air Corps at that time. Army and Navy pilots loved to take the Boeing and stand it on its tail, and fly the wings off of them for the pure enjoyment of flying. How many of our military pilots of today do the same with their supersonic jet fighters? One need only look in the cockpit of a P-12 for a partial answer to this question for there were only eight instruments for the pilot to watch and check—not so with today's modern jet fighters. Times and planes change, so it must be in a fast moving world of aviation progress.

The P-12 development takes us through no less than ten distinct types. The first P-12 of 1929 was heralded as the greatest advance in military aviation in years. Constructed of dural tubing, fabric covered and having wooden wings with corrugated metal control surfaces, it showed a top speed of 171 m.p.h. Ceiling was 29,000 feet fully loaded. A P&W R-1340 "Wasp" engine of 450 hp. powered the ship.

One XP-12A was built as a test vehicle for the newly developed NACA cowl. The fuselage was faired out to conform to the enlarged nose and a shorter landing gear was installed. The XP-12A was a modification of the 10th production P-12. It was later destroyed in a crash. The original P-12 and P-12B

Continued on page 15

Navy version of PW-9 series, the FB-5 of 1926.

Navy F2B-1 was result of Navy swing toward aircooled engines in mid-20's.

THE STRUCTURAL ENGINEERING PRACTICE OF THE WRIGHT BROTHERS

By

R. L. Bisplinghoff

Massachusetts Institute of Technology

Note: R. L. Blispinghoff is Professor of Aeronautical Engineering at the Massachusetts Institute of Technology and an Associate fellow of the IAS. He has made many notable contributions in the field of aircraft structures and dynamic analysis. In this interesting paper, the author is indebted to Dr. Hua Lin of Boeing Aircraft Company and Professor Otto Koppen of MIT.

On September 18, 1901, Wilbur Wright, in response to an invitation from Octave Chanute[1], addressed the Western Society of Engineers in Chicago on the subject, "Some Aeronautical Experiments." This is one of the infrequent appearance by either of the brothers before scientific groups. Although Wilbur obviously did not relish the prospect of speaking before a technical audience, his lecture was a remarkable summary of the state of the aeronautical art as it existed in 1901. In commencing his address, he said (1): "The difficulties which obstruct the pathway to success in flying are of three general classes: (1) Those which relate to the construction of the sustaining wings, (2) Those which relate to the generation and application of the power required to drive the machine through the air, and (3) Those relating to the balancing and steering of the machine after it is actually in flight. Of these difficulties (the first) two are already to a certain extent solved. Inability to balance and steer still confronts students of the flying problem, although nearly ten years have passed (since Lilienthal's success). When this one feature has been worked out, the age of flying will have arrived, for all other difficulties are of minor importance." Thus Wilbur Wright realized in 1901 that the principal task was one of solving the problems of stability and control. We now regard the solution of these problems by the Wrights as probably their greatest achievement. Wilbur Wright implied that the structural problems relating to the construction of the wings were already to a certain extent solved in 1901. Although we cannot quarrel with this early conclusion, it was, nevertheless, true that many of the most difficult design problems to be later overcome by the Wrights related to the structure.

Structural analysis and design was perhaps one of the most advanced of the engineering arts in the latter nineteenth century. However, there were two schools of thought about the structural configuration of lifting surfaces in 1900. On the one hand, we find the externally braced monoplane of Henson, Lilienthal, Pilcher, and Langley. The Pilcher machine is representative of this type of construction, and a sketch is shown in Figure 1. On the other hand, multi-surface machines (biplanes, triplanes, etc.) had been studied by Cayley[2] and built by Wenham, Stringfellow, Hargrave, Chanute, and Herring. The Chanute-Herring biplane is illustrated by the sketch in Figure 2. The best configuration was evidently a question that was more than mildly controversial.[3] The Wright brothers, like modern aeronautical engineers, were thus confronted at the very beginning with a choice of configuration. Their choice of the biplane was undoubtedly influenced considerably by the advice of Octave Chanute. The first recorded mention of this choice is in a letter from Wilbur Wright to Chanute, written May 13, 1900, describing the Wright 1900 glider, which is illustrated by Figure 3. He wrote (1): "In appearance it is very similar to the double-deck machine with which experiments of yourself and Mr. Herring were conducted in 1896-97." Wilbur Wright discussed this selection in his address to the Western Society of Engineers by saying (1): "The double-deck machine built and tried at the same time (by Chanute) marked a very great structural advance, as it was the first time in which the principles of the modern truss bridge were fully applied to flying machine construction." Integration of the Pratt truss biplane structure and the wing warping scheme of lateral control is one of the best examples of the Wrights' ingenuity as designers. This seemingly incompatible combination of design features was accomplished without significantly compromising the inherent structural integrity of the biplane cellule. Figure 4 shows a photograph of a simplified structural model of the 1903 machine, and Figure 5 illustrates schematic diagrams of its front and rear trusses. The two central bays are completely trussed on all four sides, forming a rigid box. The two outer bays are trussed in the plane of the front spars, and this truss carries with equal effectiveness both the upward and downward shears and bending moments on the wing. The two outer bays are trussed in the plane of the rear spars by the control wires, which form a loop, as shown schematically by the dotted lines in Figure 5. The lift wire is continuous, extending from A over pulleys B and C and terminating at D. Similarly, the anti-lift wire is continuous from E to H and passes over pulleys F and G. Warping of the wing is accomplished by applying lateral control forces to the lift wire between pulleys C and B. The lateral control forces were applied to the lift wire by cables running from a cradle in which the pilot's hips rested. With this arrangement, the wing structure forms a complete load-carrying system for all aerodynamic loads except anti-symmetric torques, which are resisted by differential bending of the spars and by the pilot.

The choice of configuration by the Wright brothers influenced airplane design for many years. Their success in achieving fully-controlled power flight inspired aeronautical engineers to adopt the trussed biplane structure for nearly thirty years. Whether their decision was the best from the viewpoint of performance of the vehicle as a whole is open to serious question. When one considers the structural materials available at the time, it was an eminently satisfactory design from the viewpoint of structural strength and rigidity. There were a disturbingly large number of early monoplane structural failures. In fact, such failures persisted for many years due principally to lack of torsional and down-bending strength of the lifting surface. This situation was often the result of attempts by monoplane designers to reduce the height of cabane struts to such an extent that under down loads and torsional loads, the anti-lift wires were acting principally to induce compressive loads in the spars. The question of monoplane structural integrity reached such serious proportions in 1913 that the British government appointed a committee to inquire into accident causes, and in the meantime grounded all military monoplanes. Although the committee concluded that the accidents were not caused by conditions peculiar to monoplanes, the British War Office virtually stopped monoplane construction. The monoplane as a high performance military machine nearly disappeared by the end of World War I. It was not until the early thirties that the emergence of aluminum alloys made it possible to build ful cantilever monoplanes with adequate strength and torsional rigidity. Thus in the area of structural configuration, where the Wright brothers are generally supposed to have made little or no contribution, it must be conceded that, in the light of later experience, they exercised exceptionally sound engineering judgment.

Successful structural design depends upon close attention to detail as well as selection of basic configuration. The Wrights chose design load factors remarkably similar to those employed by aeronautical engineers today. For example, in connection with the 1900 glider, Wilbur Wright wrote from Kitty Hawk on September 23, 1900, to his father (1): "I am constructing my machine to sustain about five times my weight and am testing every piece." The 1903 machine was static-tested. On December 2, 1903, Wilbur wrote George A. Spratt (1): "We hung it on its wing tips some days ago and loaded the front set of trussing to more than six times its regular strain in the air." The Wrights also appreciated the dangers of excessive vibration, and they vibration-tested the 1903 machine by suspending it at its wing tips with the pilot aboard and with the engine running. Although they could not afford destruction tests of their early machines, ultimate-load static tests were conducted on later machines by military agencies. In 1911, a static test of the Wright 1909 flyer by the French army showed it to have an ultimate load factor of 4, based on its flying weight. Other contemporary machines were tested at the same time. The Farman biplane had an ultimate factor of 2¾, whereas the Antoinette and Bleriot monoplanes were good for ultimate factors of only 1½ and 1¼ respectively (5). The early Wright airplanes did not have a drag truss in the plane of the wing, and the fabric covering served as a shear web.

Continued on page 6

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[1] Octave Chanute, who was at this time president of the Western Society of Engineers, was an American civil engineer who became actively interested in flying in 1895. An intimate relationship between the Wrights and Chanute was started in May, 1900. From Chanute, the Wrights learned much of what their predecessors had done. Because he recognized that the Wrights were far ahead of others, Chanute encouraged them to continue their experiments when they might have quit. His counsel of the Wrights was perhaps his greatest contribution to the art of flying.

[2] Sir George Cayley (1773-1857) was a talented engineer, who contributed to many fields. He was the first to consider on a scientific basis the problems of wing loads, bending moments, and the necessity for combined lightness and strength. Cayley probably conceived first the idea of the biplane with struts and diagonal bracing (2, 3).

[3] For example, the Englishman, Percy Pilcher (1866-1899), a student of Lilienthal, was a champion of the monoplane and an outspoken critic of the biplane (4). He later lost his life on September 30, 1899, as a result of a structural failure in flight.

Fig. 1. Pilcher's Glider of 1899 illustrating the structural arrangement of a typical single surface machine.

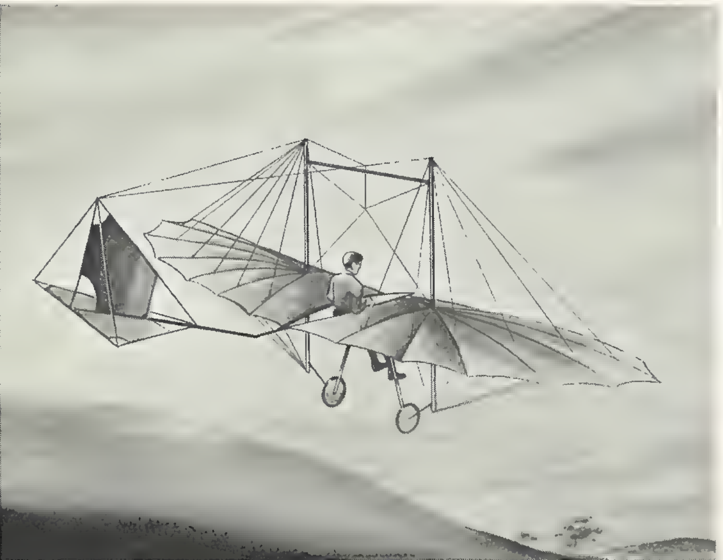
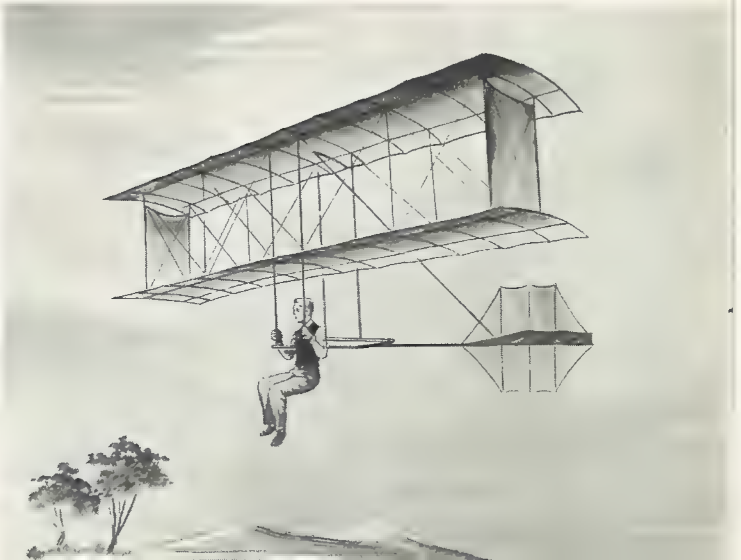


Fig. 2. Chanute-Herring double surface machine of 1896.



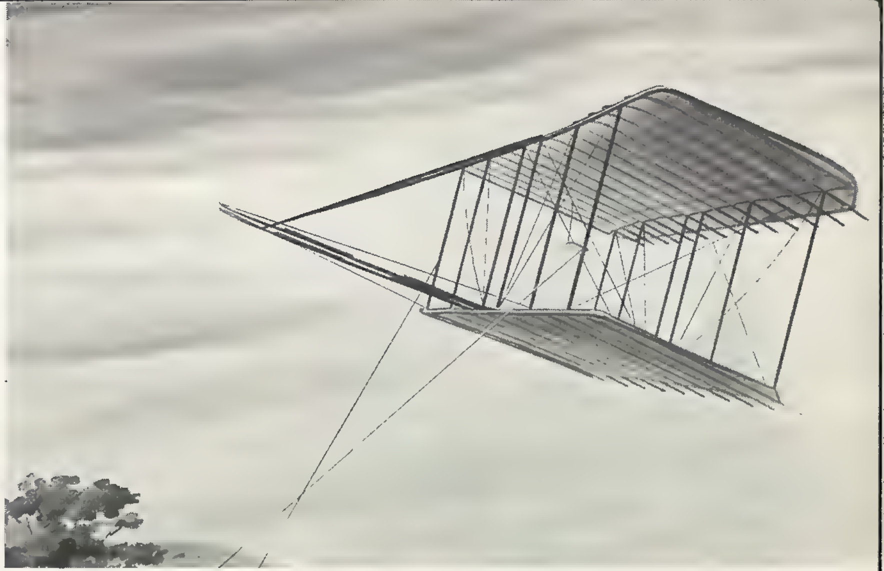
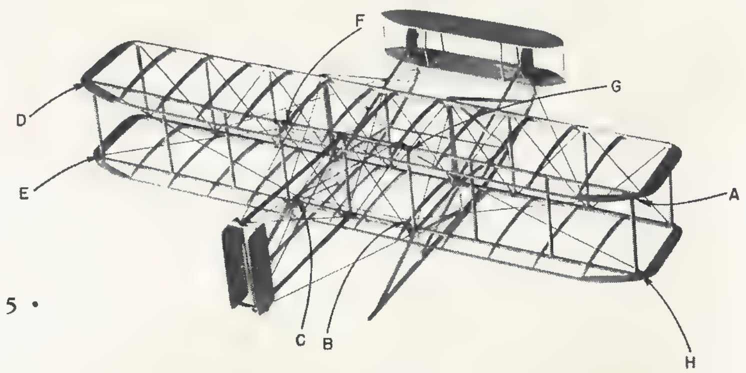


Fig. 3. Wright 1900 Glider flying as a kite.

Fig. 4. Structural model of 1903 Wright Brothers machine.



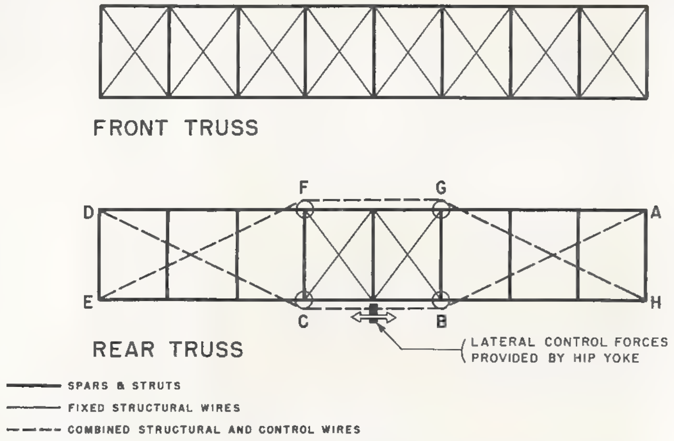

FRONT TRUSS
F
G
D
A
E
H
C
B
REAR TRUSS
LATERAL CONTROL FORCES PROVIDED BY HIP YOKE
SPARS & STRUTS
FIXED STRUCTURAL WIRES
COMBINED STRUCTURAL AND CONTROL WIRES

Fig. 5. Schematic diagrams of front and rear trusses of 1903 Wright Brothers machine.

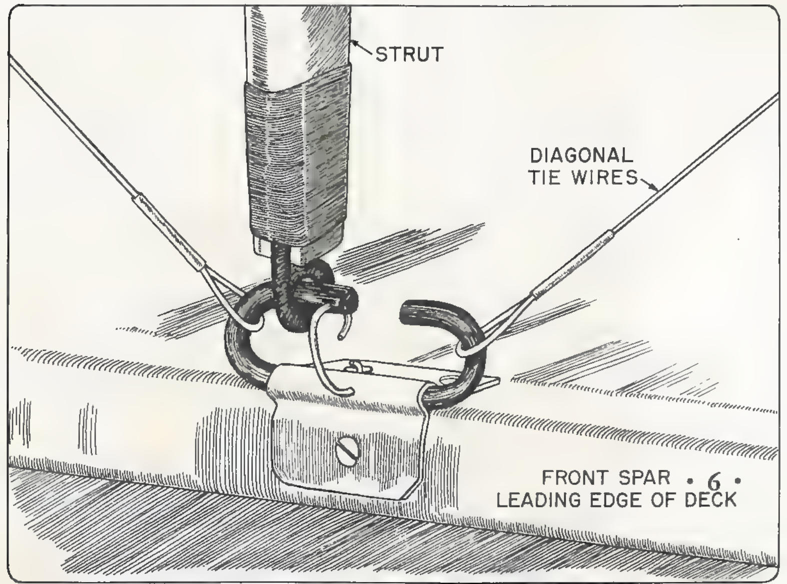
The fabric was put on with the threads at 45° to the spars, indicating that the Wrights had an early appreciation of the tension field web. In fact, this employment of the fabric constituted one of the claims of the Wright patent (6). By this arrangement of the threads, "we secure a surface of very great strength to withstand lateral and longitudinal strains, but capable of some twisting movement." The detail structural design practiced by the Wrights, although sometimes criticized, invariably embodied a remarkable amount of originality and common sense. This statement can be strikingly illustrated by referring to the sketch of Figure 6. It shows a fitting connecting the struts and flying wires to the main spar of a lifting surface. The simplicity of this fitting, contrasted with the complexity of modern aircraft fittings, merits a few moments reflection and speculation on how the same job would be done by each of us today.

The Wrights were familiar with the fundamentals of stress analysis, and in a letter written by Orville Wright to Willard Drigers in 1934, he stated (5) that they made simple analyses of the 1903 machine as well as of the gliders which preceded it. They had an especially keen appreciation of the material properties required for a satisfactory structure, and they made use of the best materials available at the time. For example, they preferred white Eastern sprue and second-growth ash in the construction of frames, spars and struts. Their propellers, which were of a "built-up" type of construction, were also sprue. Eastern spruce was selected because a simple test indicated greater shock-resisting ability and because in Orville's words (5): "We figured that we would get a slightly increased strength with the light spruce because, with the same weight, the cross section would be greater." The significance of this reasoning, applied to the design of struts, requires no explanation to modern structural engineers. The fabric used by the Wrights on their early machines was undoped "Pride of the West" muslin as sold over the counter by dry goods stores. The bracing wires consisted of circular, cross section piano wire having a carbon content of roughly 0.7 per cent.

The biplane structural configuration, with its high torsional rigidity, precluded the occurrence of serious aeroelastic difficulties. This was a fortunate feature of the Wright design, since several of the early monoplanes experienced static aeroelastic problems due to lack of torsional rigidity. However, like most airplane designers, the Wrights were unable to avoid aeroelastic difficulties completely. The propeller blades, which were actually slender cantilever wings, provided their only serious aeroelastic difficulties. In a letter to Mr. Fred C. Kelley (7), Orville Wright described how, in an attempt to make the blades broader and thinner, they encountered an unexpected loss in thrust. They concluded finally that the blades twisted from their normal pitch setting under pressures in flight. To verify this, they fastened to the blades small trailing edge tabs, which they called "little jokers," set at an angle to counteract the aerodynamic torques that were twisting the blade. After they found that the "little jokers" alleviated the problem, they gave a backward sweep to the trailing edges of their subsequent propeller blades, which served the same purpose.

The Wrights' solution of structural problems, although not nearly so historically significant as their solution of the problems of stability and control, were carried out with exceptional skill, and with full advantage of the art of structural engineering as it existed in their day. Their examples of structural design practice provided a substantial beginning to a continuing quest for lighter and stronger structures which, during the past fifty-three years, has resulted in a remarkable improvement in the effectiveness of aircraft.

Fig. 6. Fitting employed by the Wright Brothers. (Courtesy Flight Magazine)



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WRIGHT AIRPLANES 1903-1911

By

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Note: In the eight years following Kitty Hawk, the Wrights developed several models. Technical descriptions of the principal models are summarized here as reprinted from "Aerosphere," 1943 edition, with permission of the author.

Year of Construction: 1903
Model: Original Powered Machine 1 Place — Experimental

Specifications: Span, 40 ft. 4 in. Length, 19 ft. 9 in. Height, 8 ft. Chord, 6 ft. 6 in. Camber, 1/20. Aspect ratio, 6:2. Wing area, 510 sq. ft. Horizontal control area, 48 sq. ft. Rudder area, 20 sq. ft. Power loading, 62 lb./hp. Wing loading, 1.46 lb./sq. ft. Empty weight, 605 lb. Gross weight, 745 lb.

Construction: Fuselage; there was no fuselage proper—the pilot operated the machine from a prone position on the lower wing slightly to the left of center, the operator's weight balanced that of the engine which was fastened to the wing beams. Wings; the biplane cellule was constructed with spars and ribs and covered with unbleached muslin on both the upper and lower surfaces, the muslin was not doped or treated, the front spar formed the leading edge of the wing and the rear spar was located about two thirds aft, the spars and struts were of spruce and the ribs of second growth ash, the complete wing cellule was divided into eight bays and braced with steel wire, the outer two bays on either side could be deformed helically for banking. Control Group; the elevation control surfaces were carried on struts forward of the wing and were rigid along the center line, the leading and trailing edges could be moved upward and downward to change the camber and thus cause the machine to ascend or descend, this camber change was controlled by the operator moving a lever fore and aft, wing warping in conjunction with rudder motion was controlled by a cradle in which rested the operator's hips, the operator in a prone position on the lower wing rolled his body from side to side to produce banks as the rudder action was only to offset the yaw produced by the banking, the rudder was carried aft.

Performance: Maximum speed, 31 m.p.h.

Engine: Wright (liquid cooled, four cylinder, horizontal), 12 hp. at 1025 r.p.m.

Year of Construction: 1904
Model: Second Powered Machine, 1 Place — Experimental

Specifications: Span, 40 ft. 4 in. Length, 19 ft. 9 in. Height, 8 ft. Chord, 6 ft. 6 in. Camber, 1/25. Aspect ratio, 6:2. Wing area, 510 sq. ft. Horizontal control area, 50 sq ft. Rudder area, 20 sq. ft. Power loading, 53 lb./hp. Wing loading, 1.76 lb./sq. ft. Empty weight, 690 lb. Gross weight, 900 lb.

Construction: Fuselage; following closely the form of the 1903 model, the position of the pilot lying prone on the lower wing was the same, and the outriggers were placed fore and aft to carry control surfaces.

Performance: Maximum speed, 34 m.p.h.

Engine: Wright (liquid cooled, four cylinder, horizontally), 17 hp. at 1500 r.p.m.

Year of Construction: 1905
Model: Third Powered Machine, 1 Place — Experimental

Specifications: Span, 40 ft. 4 in. Length, 26 ft. 3 in. (estimated). Height, 8 ft. Chord, 6 ft. 6 in. Camber 1/20. Aspect ratio, 6:2. Wing area, 510 sq. ft. Horizontal control area, 85 sq. ft. Rudder area, 34 sq. ft. Power loading, 46 lb./hp. Wing loading, 1.8 lb./sq. ft. Empty weight, 785 lb. Gross weight, 925 lb.

Construction: Fuselage; design followed that of the 1903 and 1904 models, the pilot lying in a prone position on the lower wing and having the control surfaces carried on outriggers, the principal difference being that the whole structure was increased in strength.

Performance: Maximum speed, 38 m.p.h.

Engine: Wright (liquid cooled, four cylinder, horizontal), 20 hp. at 1500 r.p.m.

Year of Construction: 1907
Model: French Demonstration, 2 Place Commercial Aircraft — Exhibition

Specifications: Span, 41 ft. Length, 21 ft. 6 in. Height, 7 ft. 6 in. Chord, 6.56 ft. Aspect ratio, 6:25. Wing area, 536 sq. ft. Horizontal control area, 65 sq. ft. Rudder area, 27 sq. ft. Power loading, 41 lb./hp. Wing loading, 2.05 lb./sq. ft. Empty weight, 750 lb. Gross weight, 1,100 lb.

Construction: Fuselage; first model on which the pilot did not lie prone on the wing, two seats were arranged on the front of the leading edge on top of the lower wing surface of the center section, the pilot sat on the left, the engine was mounted to the right, the passenger was carried on a seat at the center so that the machine's lateral balance remained the same whether a passenger was carried or not, outriggers fore and aft carried control surfaces as in previous models, the forward outriggers were hinged at the leading edge of the wings so that they might be folded back to facilitate transportation, the rear outrigger assembly was totally removable.

Engine: Wright (liquid cooled, four cylinder, vertical), 25 hp. at 1630 r.p.m.

Year of Construction: 1908
Model: Transition Trainer

No specifications are available. This model was the 1905 machine modified as follows: The new form of control existing on the 1907 airplane sent to France was incorporated.

Year of Construction: 1908
Model: "Wright Flyer" 2 Place—Military Aircraft — Experimental

Specifications and descriptions of this model are not presented. Except for a few minor details, the airplane was similar to the 1909 model finally accepted by the Army.

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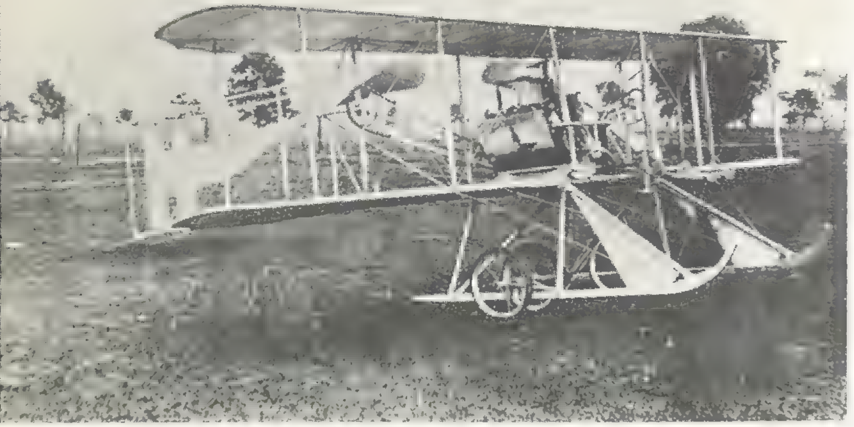
Wright Brothers 1903 machine at Kitty Hawk.



The "Baby Wright" Gordon-Bennett Racer.

Year of Construction: 1909
Model A — 2 Place — Commercial Aircraft — Exhibition and Training

Specifications: Span, 41 ft. Length, 32 ft. 6 in. Height, 8 ft. 6 in. Chord, 6.56 ft. Aspect ratio, 6.25. Gap, 6 ft. Wing area, 538 sq. ft. Horizontal control area, 70 sq. ft. Rudder area, 23 sq. ft. Power loading, 41 lb./hp. Wing loading, 2.05 lb./sq. ft. Empty weight, 750 lb. Total weight, 1,100 lb.

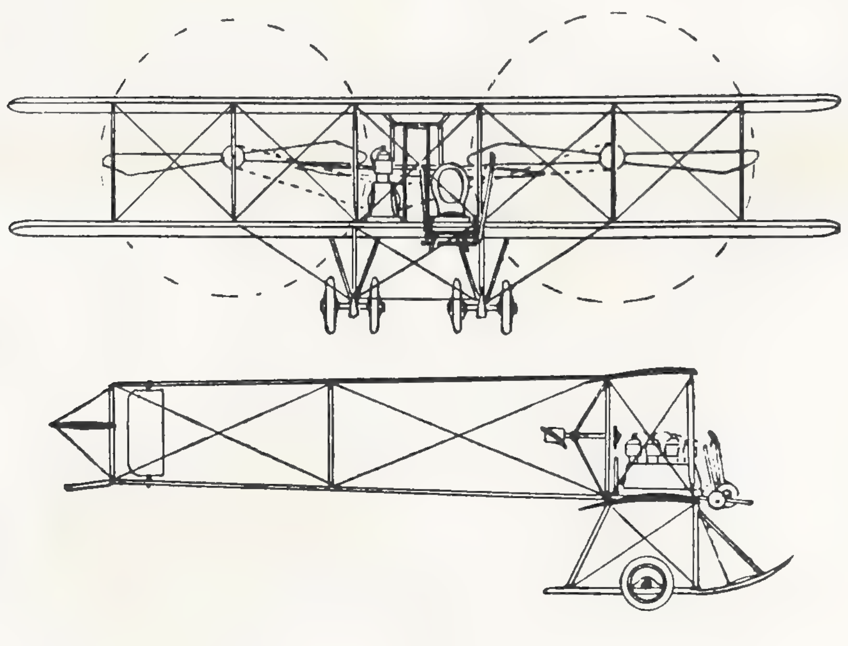
Construction: Fuselage; no fuselage proper, there being a structure beneath the lower wing which formed the landing skids and extended forward to carry the horizontal elevation control, two booms extended aft to carry the directional rudder, the extending structure in front was so arranged that it could be folded against the leading edge of the wing to make the machine portable whereas the rudder and its outriggers were removable.

Performance: Maximum speed, 40 m.p.h.

Engine: Wright (liquid cooled, four cylinder, vertical), 25.28 hp. at 1,310 r.p.m.

Year of Construction: 1909
Model: Second Army Model — 2 Place — Military Aircraft — Reconnaissance

Specifications: Span, 36 ft. 4 in. Length, 28 ft. Height, 8 ft. 6 in. Chord, 5 ft. 9 in. Aspect ratio, 6.25. Wing area, 416 sq. ft. Horizontal control area, 70 sq. ft. Rudder area, 18 sq. ft. Power loading, 40 lb./hp. Wing loading, 2.9 lb./sq. ft. Empty weight, 740 lb. Gross weight, 1,200 lb.



Front and side elevation of Wright Model R.

Construction: Fuselage; no fuselage proper was existent on this airplane, the pilot and passenger sat on seats located at the leading edge of the lower wing center section, the pilot sat to the left with the passenger in the middle thus causing no lateral unbalance when a passenger was not present; an upper and lower outrigger braced with wire and fastened to the wings.

Performance: Maximum speed, 42 m.p.h. Range, 3 hr. 30 min.

Engine: Wright (liquid cooled, four cylinder, vertical), 30 hp. at 1,210 r.p.m.

Year of Construction: 1910

The Wright Model A underwent several changes in 1910. The first of these was the addition of a movable monoplane horizontal control surface at the rear of the wings. This surface was mounted aft of the rudder which was at that time supported by four outriggers instead of two. Later the machine was tried with the upper surface of the forward elevator removed, and finally the front elevation control was entirely removed and the monoplane surface located in the rear was increased in area. These machines were flown with the struts and long skids, which were incorporated in the Model A to carry the horizontal control, left intack. Later machines were constructed with wheeled landing gear which became standard with the Model B of 1911. Other innovations included the use of rubberized fabric covering for all surfaces.

Year of Construction: 1910
Model R (Roadster) 1 Place — Commercial Aircraft — Exhibition

Specifications: Span, 26 ft. 6 in. Length, 24 ft. Height, 6 ft. 10 in. Chord, 3 ft. 7 in. Aspect ratio, 7.4. Wing area, 180 sq. ft. Horizontal control area, 14 sq. ft. Power loading, 25.4 lb./hp. Wing loading, 4.20 lb./sq. ft. Empty weight, 585 lb. Gross weight, 760 lb.

Construction: Fuselage; the framework of this model varied radically from its predecessors, there being a structure of four outriggers connected with vertical and horizontal struts and braced with wire which carried the elevator and rudder aft of the wings, the skids which normally extended far in front of the wings to carry the horizontal control surface were shortened and a wheeled landing gear added. Wings; wings followed the conventional plan form except that due to the shortness of the span only the outer bay on either side was made flexible for warping, the outboard struts were placed inward about 16 inches from the wing tips to give an overhang not customary for previous Wright designs. Control Group; control was obtained with the customary tw ocontrol levers, one operated the elevator and the other the wing warp and rudder, wing warping was obtained by moving the control backward and forward instead of side to side as in previous designs, the top portion of the lever was hinged so that by moving the hinged portion from side to side the wing warp could be operated independently, two rudders placed side by side were located forward of the horizontal control surface. Landing Gear; landing gear consisted of four wheels mounted with rubber shock cord, side-by-side arrangement with two being fastened to each of the skids slightly forward of the center of gravity, two tail skids were carried at the aft end of the rear outriggers, the skids projected forward sufficiently to prevent nose-overs.

Performance: Maximum speed, 54.5 m.p.h.

Engine: Wright (liquid cooled, four cylinder, vertical), 30 hp. at 1,600 r.p.m.

Year of Construction: 1910
Model: "Baby Wright" (Gordon-Bennett Racer) 1 Place — Commercial Aircraft — Racer

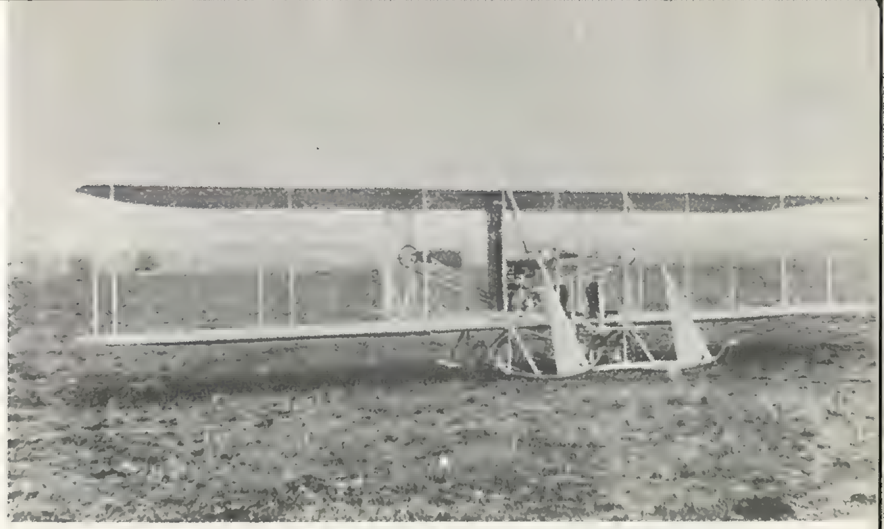
Specifications: Span, 21 ft. 5 in. Length, 24 ft. Height, 6 ft. 10 in. Chord, 3 ft. 6 in. Aspect ratio, 7:4. Wing area, 145 sq. ft. Horizontal control area, 14 sq. ft. Power loading, 14.3 lb./hp. Wing loading, 5.92 lb./sq. ft. Empty weight, 685 lb. Gross weight, 860 lb.

Construction: Fuselage; following the Model R, this was a structure of four outriggers connected with vertical and horizontal struts and braced with wire which carried the elevator and rudder aft of the wings, the skids which normally extended far in front of the wings to carry the horizontal control surface were shortened and a wheeled landing gear added.

Engine: Wright (liquid cooled, eight cylinder, Vee type), 60 hp.

Year of Construction: 1911
Model EX

The Model EX was a modification of the Model R, having the wing span increased to 32 feet. Powered with a four-cylinder thirty-horsepower engine, it was primarily designed for exhibition flying. Piloted in 1910 by Galbraith Rodgers, the Model EX was the first airplane to fly across the United States from coast to coast, taking forty-nine days to complete the journey.



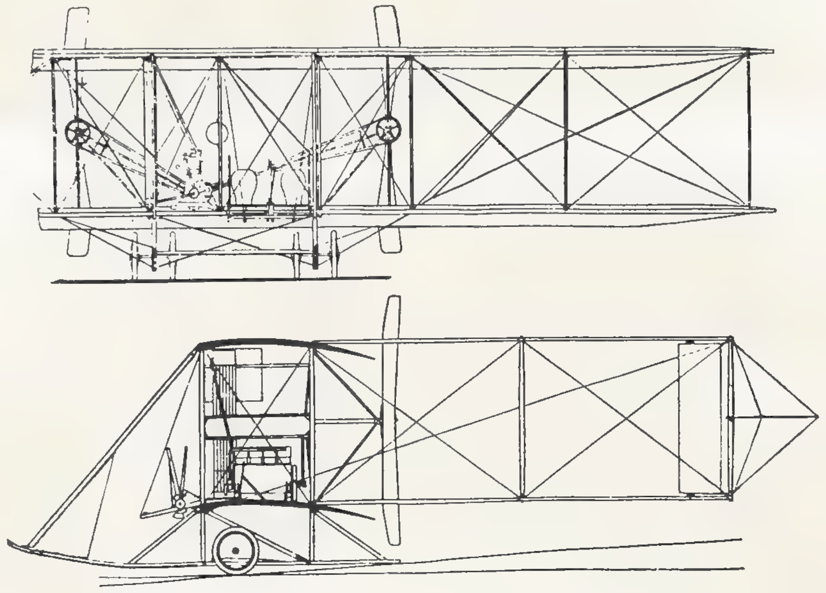
Wright Model B

Year of Construction: 1911
Model B — 2 Place — Military and Commercial Aircraft — Exhiibtion and Reconnaissance

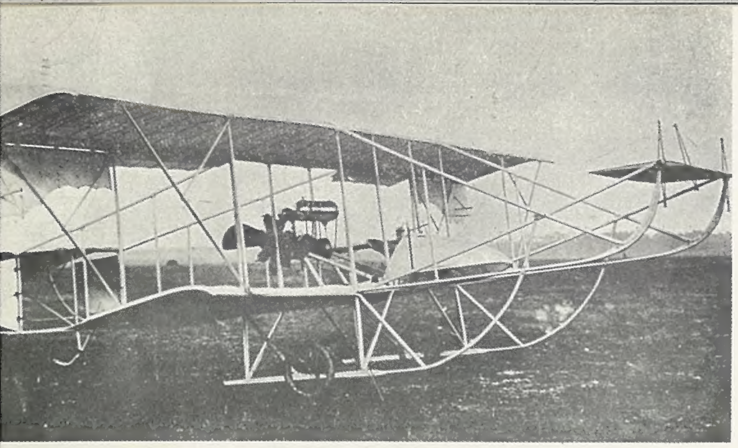
Specifications: Span, 38 ft. 6 in. Length, 28 ft. Height, 8 ft. Chord, 6 ft. 2 in. Camber, 1/20. Aspect ratio, 6.25. Wing area, 470 sq. ft. Horizontal control area, 40 sq. ft. Rudder area, 15 sq. ft. Power loading, 40 lb./hp. Wing loading, 2.7 lb./sq. ft. Empty weight, 850 lb. Gross weight, 1,270 lb.

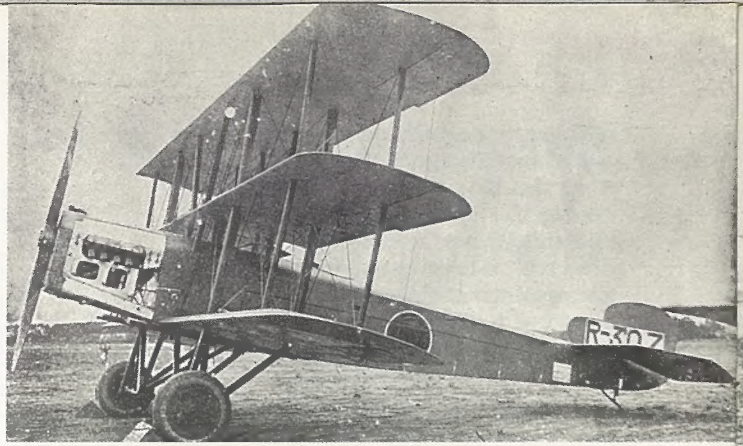
Construction: Fuselage; although a direct descendant of the Model A, the structure which carried the rudders was changed to four outriggers in box form which had vertical and horizontal struts braced with wire, this was removable for transporting, the forward skid was cut off at a point just forward of the bracing member which came down from the leading edge of the upper wing and was constructed so that it could folk back on either side against the leading edge of the wings, spruce was used throughout the framework. Wings; wing construction followed accepted Wright practices of previous years except for rubberized covering. Control Group; control differed from previous Wright machines only in the location of the horizontal surface which was moved aft of the rudder, this monoplane surface was arranged with the forward third being fixed and the rear two-thirds made flexible and controlled by the conventional lever.

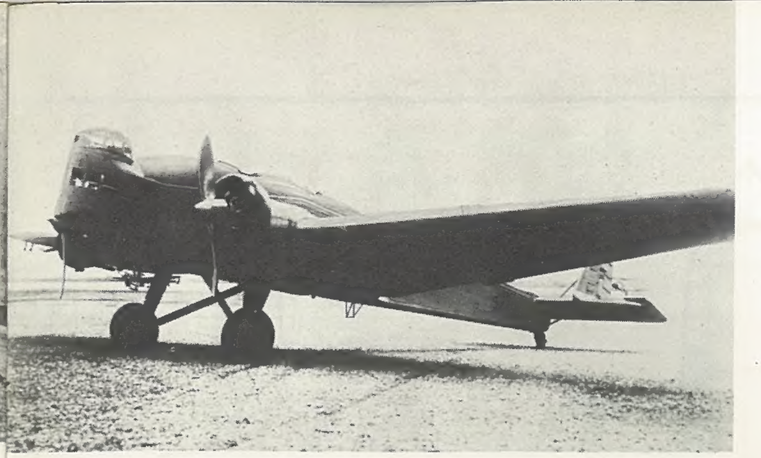
Engine: Wright (liquid cooled, four cylinder, vertical), 30.35 hp. at 1,325 r.p.m.

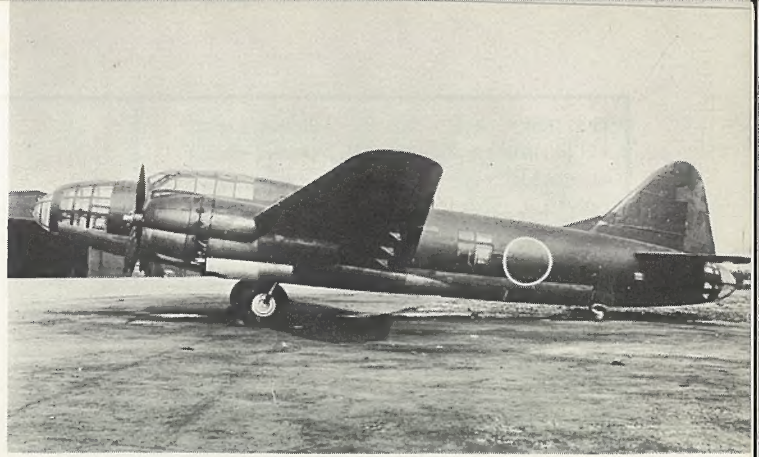


Front and side elevation of Wright Model B.


1911 type Tokugawa. The first army airplane built in Japan. Powered by a 50 h.p. Gnome rotary, closely followed lines of the French Farman biplanes.


1921 Mitsubishi type 10, first torpedo attack airplane ever designed for carrier use. Designed by Prof. Smith, originally with Sopwith Company.


Mitsubishi type 93 twin engine light bomber (Ki-2). Typical of early period multi-engine development.


Mitsubishi type 1 "Betty" attack. Navy workhorse was used as bomber, transport, and missile carrier.

JAPANESE AIRCRAFT

Jim Tindal

There has been considerable speculation and very little evaluation of Japanese aeronautical achievements. The advancements and ability exhibited by them in World War II came as a complete surprise. Japanese engineers were ingenious, progressive, and ambitious in aircraft design and production — contrary to the fostered, costly opinions of Western Nations. Japan's defeat became inevitable when her air forces lost control of the skies. The final and decisive factor that grounded Japanese airpower was American mass production technique. These statements violate popular opinions but even a cursory examination of Japan's aviation progress will reveal the truth of these remarks.

The earliest Japanese effort was made as early as 1877 when plans were laid to establish a balloon study group. Nothing came from this proposal but in July, 1909 a Temporary Military Balloon Study Group was established. This was their first organized aviation effort although some successful flying experiments had been carried out previously by Chuhachi Ninowiya with an ornithopter glider. The Balloon Study Group sponsored the first public exhibition flights and supervised construction of airplanes for the army. The group received criticism from time to time, and occasional changes were made within the group, but it established aviation in Japan. It was successful in almost every phase of aviation except for its high speed studies which proved disappointing. Some Western technology was employed through necessity but by and large this program was dependent upon Japanese technicians. The Balloon Study Group was disbanded in 1920 and subsequently the Tokyo University aeronautical laboratory was formed with Dr. Tanakadati as director, to continue research.

The Japanese army established its first aircraft construction facility at Tokorozaua in April, 1911. Army airplanes attacked Tsingtau fortress in 1914. Other Army aircraft manufacturing facilities were established at Kaishikawa during 1914. Japanese pilots joined in the battles on the Italian Alpine front in 1918. Army airplanes accompanied the Japanese army sent to Siberia. Since the Japanese were unable to produce high speed designs, the army invited a French mission to teach them all phases of aviation during 1919. The mission laid the foundation for further development of the army air force and it began to depend upon civilian manufacturers. By 1926 all development was in the hands of civilian companies.

The Navy formed its own aircraft technical committee in 1912. This group was responsible for construction of airplanes, engines, and the first seaplane tender "Wakamiya". In 1916 they established the Kure technical ordnance—the beginning of a series of facilities to insure research and production. The Navy began a reorganization program in 1921 and invited a British mission to teach it all phases of aviation. A Navy aircraft headquarters division was established in 1927. In 1932 they instituted a program for aircraft development according to new tactical concepts that fitted their national characteristics. This was the beginning of a period of high technical achievements for the navy that lasted through World War II.

The first civilian airplane manufacturer was formed by Chikuhei Nakajima and Seibei Kawanishi as the Japan Airplane Manufacturer, Inc., in December 1917. This concern was disbanded in 1919 but two aircraft producers were established in its place, the Nakajima Airplane Co., and the Kawanishi Machine Manufacturer. The civilian concern to produce airplane engines was Mitsubishi's Kobe internal combustion engine division, established in 1916. Most early Japanese airplanes showed definite western technological influences, or were licensed western designs. This was recognized as an unhealthy situation and an accelerated program was started to provide Japanese engineers with the proper background so they might become independent in their endeavors.

Although this plan was never completely successful it did bear fruit. In order to accomplish their purpose many Japanese engineers were sent abroad to study design and production techniques. The importation of foreign experts was practiced universally by the industry from 1923 to 1933. The manufacturers went heavily into the purchase of foreign patents and license of all kinds. Engine, accessory and instrument patents were purchased in wholesale quantities. But 1932 Japanese designers were being encouraged to utilize their own ideas. Although many restrictions were placed in the design requirements, some successful designs were forthcoming and by 1935 Japan's designers were turning out machines that compared favorably with modern western designs.

The chain of events of 1934-35 were such that attention was diverted from Japan to other quarters. The last western technicians left Japan and independent Japanese efforts no longer received publicity. This fact, coupled with our misunderstanding of their designations and the security measures employed, created a false impression which has never been completely dispelled.

The world record flights that occurred between 1935 and 1940 should have been a forewarning of their potential. One of the most outstanding flights accurred in December 1936 when

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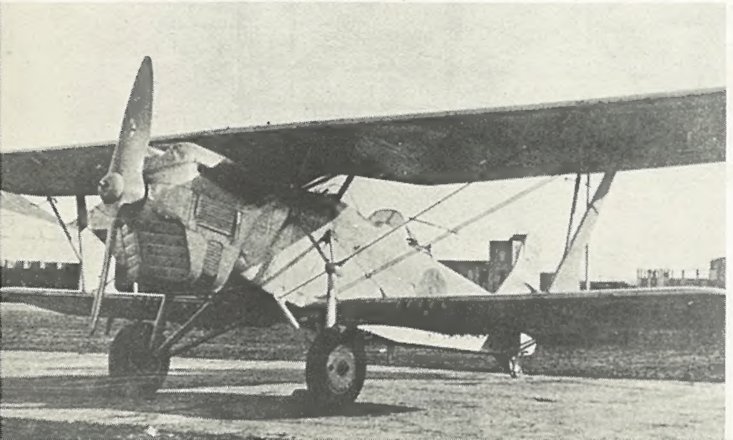
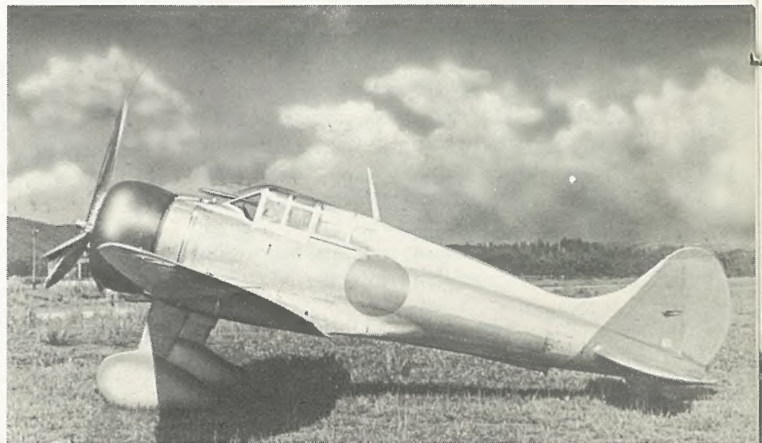
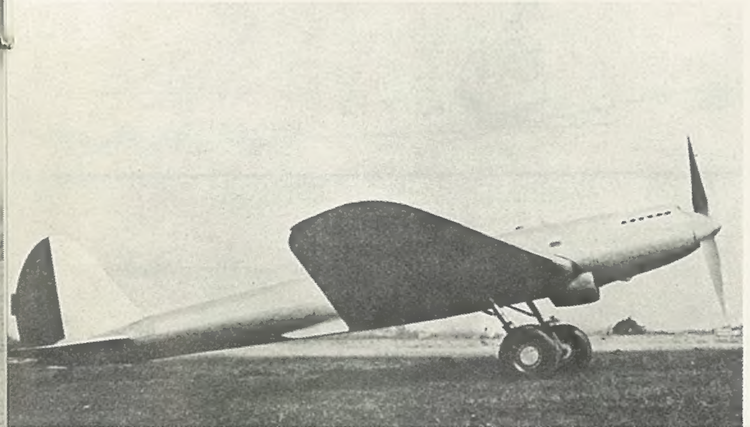
Kawasaki type 93 light bomber (Ki-3). Powered by licensed German BMW engine, was used extensively against Chinese.



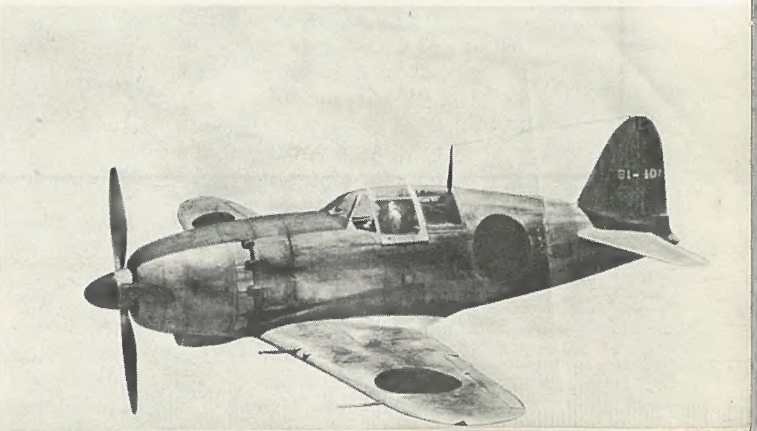
Mitsubishi type 96 carrier fighter model 22 AFM2. First flown in 1936. Bloodlines of later "Zeke" or Zero Sen are apparent.

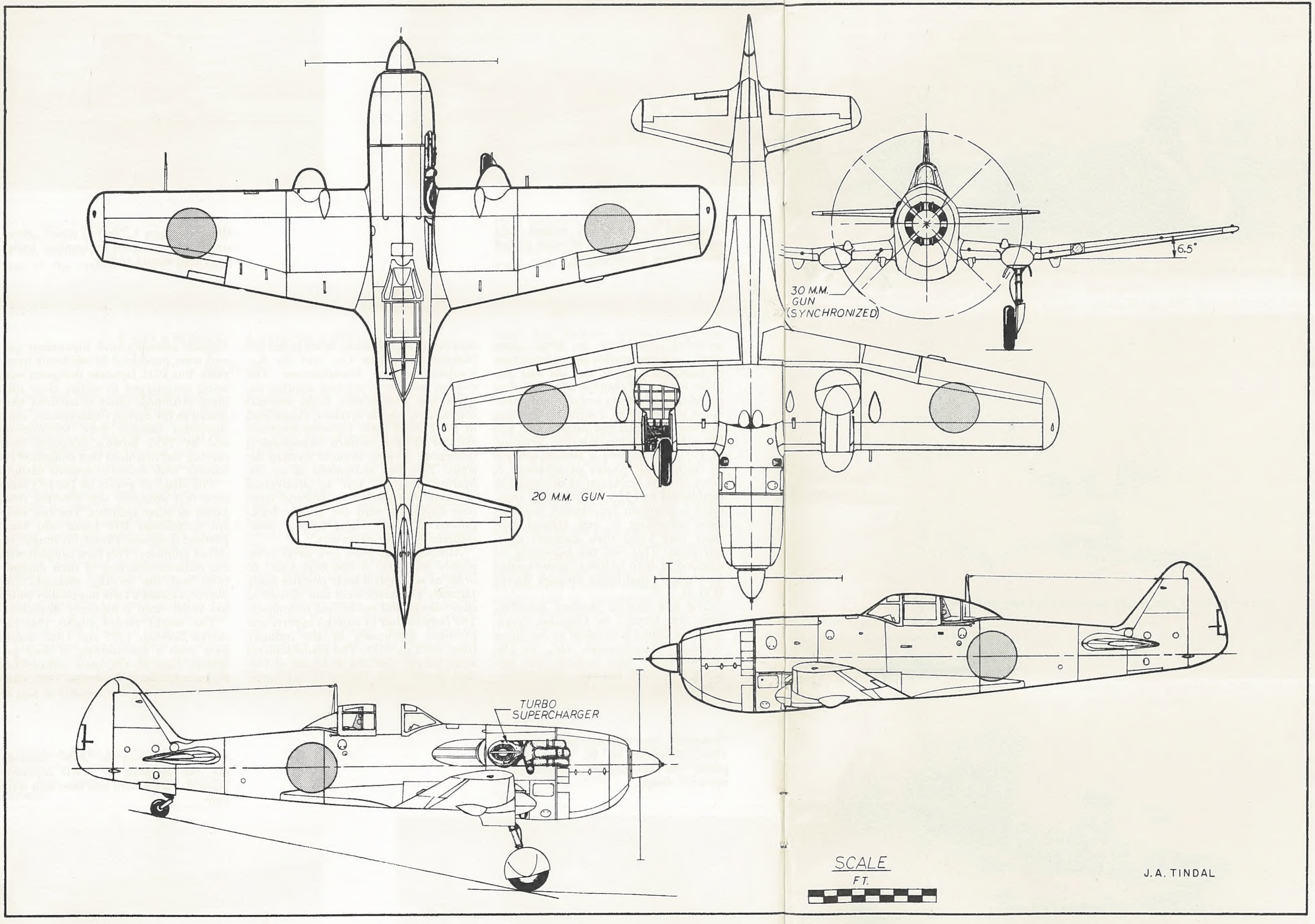


"Kokenki" long distance monoplane of 1938. Designed by Dr. Kimura, airplane was exceptionally clean aerodynamic design.



Mitsubishi "Raiden" or "Jack" interceptor. The toughest of WWII Japanese fighters. Fortunately less than 600 were built.





Nakajima Ki-87 — Three View

Mitsiubishi's "Otori" flew over 2,000 miles from Tokyo to Bangkok in 21.5 hours. In April 1937 the "Kamikaze" flew from Tokyo to London, a distance of 9,600 miles in 94.2 hours. The third outstanding flight occurred in 1938 when the "Kokenki" flew 7,245 miles in 62.5 hours. This airplane was designed by Dr. Kimura who also designed the A-26 which flew 10,213 miles at an average speed of 174 mph in 1944. A bomber development of this design, the Ki-74, was produced for the sole purpose of bombing the U. S. Fortunately, only 14 of these machines were built and the war ended before they saw any such service.

Japanese pilots were highly skilled and exhibited exceptional courage. One has only to read Saburo Sakai's wartime autobiography to appreciate this fact. (Japan's leading World War II ace,

Continued on page 14

The best Japanese army fighter plane was the Nakajima Ki-84, 4 Type Fighter (Frank) "Hayate." This type was in service from April 1944 to the end of World War II.

The Ki-87 would have superseded the Ki-84 as the No. 1 Japanese army fighter if the war had been prolonged. Production of this design was precluded by the exhaustive Ki-84 production and a forced production schedule on the Ki-115. The Ki-115 was a special attack airplane designed specifically for suicide missions, and placed in quantity production as a desperate measure to forestall defeat after U. S. forces captured Okinawa. The Ki-47 was to have been the Japanese Army Air Force's answer to the American B-29 bomber menace. Two prototype Ki-87's were built. The first model was fitted with a Nakajima Ha-44 Model 21 engine. The supercharger was carried outside the fuselage and did not use cooling air but depended upon a complicated arrangement of tubes for cooling exhaust gases. The second prototype was fitted with a cylindrical cockpit liner for pressurization at high altitudes.

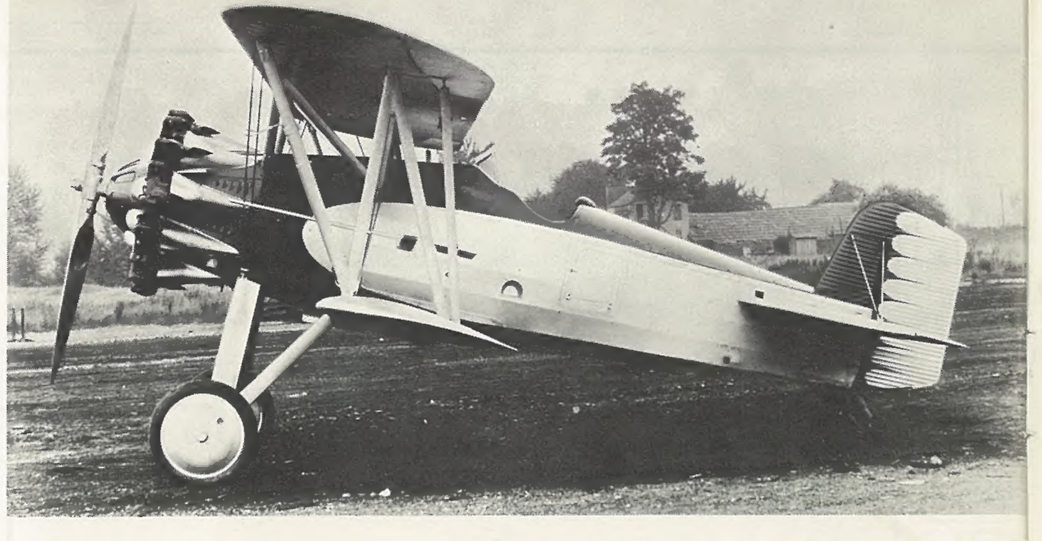
Maximum speed, 459 m.p.h.
Service ceiling, 38,896 ft.
Gross weight, 13,451 lb.
Wing loading, 48.15 lb./sq. ft.
Power loading, 5.67 lb./hp.
Wing span, 44 ft. 1.32 in.
Length, 38 ft. 9.36 in.
Height, 13 ft. 9.36 in.
Wing area, 279.76 sq. ft.
Engine, Nakajima Ha-217, 2,370 hp.
Ordnance, 2-30 and 2-20 mm. guns,
1—550 lb. bomb

credited with shooting down 64 American airplanes). Also Japan's production potential was very surprising. When the war started she possessed approximately 1,600 first line combat machines. By mid-1943 this figure had increased to nearly 2,700 airplanes. By July 1944 they were producing 1000 aircraft per month and the total for that year was around 25,000 machines. When Japan was forced to employ defensive tactics her engineering personnel met the challenge. They turned out bombers that were quite fast, had long range capabilities, carried heavy bomb loads and good defensive armament. Night fighters began using radar. The most amazing airplanes were their torpedo bombers were proved to be the fastest in the world. Their new crop of fighters were maneuverable, well protected, heavily armed, very capable in combat above 20,000 feet and could survive under heavy punishment. These weapons coupled with new tactics gave a good account of themselves as was illustrated by a typical engagement that occurred in late 1944 over Amani Ushima island. On this particular occasion 34 Japanese fighters engaged 72 U. S. fighters and shot down 20 machines with a loss of 12 of their own.

At the War's end about 13,000 first line airplanes were found in the Japanese home islands. Allied technical analysis showed the Japanese air forces were far more diversified than had been previously supposed. Furthermore, these studies revealed that Japanese airplanes had performance, design, and workmanship that could be respected by any nation in the world.

After World War II Japan's aircraft industry was forced to produce everything from gadgets to motor buses to survive. However, she was able to retain a very large portion of her wartime skilled labor. With the peace treaty in 1952 many of the aircraft and accessory manufacturers re-entered the aircraft field. These companies are now working under severe restrictions and Japan's present activities may seem insignificant. Nevertheless, that nation has the potential required to fill the Pacific defense gap. She has sufficient talent to assist the U. S. in relieving its potential aircraft engineering shortage.

The author realizes the futility of attempting to cover a subject of this scope in an article of this limited space and the foregoing statements are in no way designed or intended to detract or belittle allied participation or victories won during World War II. They are simple statements of fact that may help wipe out some of the injustice inflicted against Japanese technological ability.



Boeing model 89 was prototype of series and was first flown in 1928.

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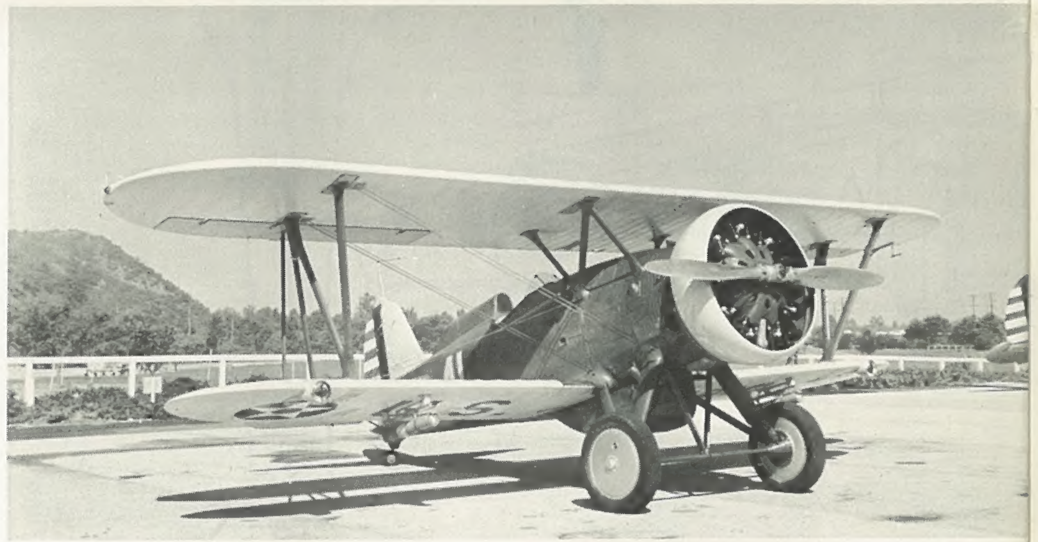
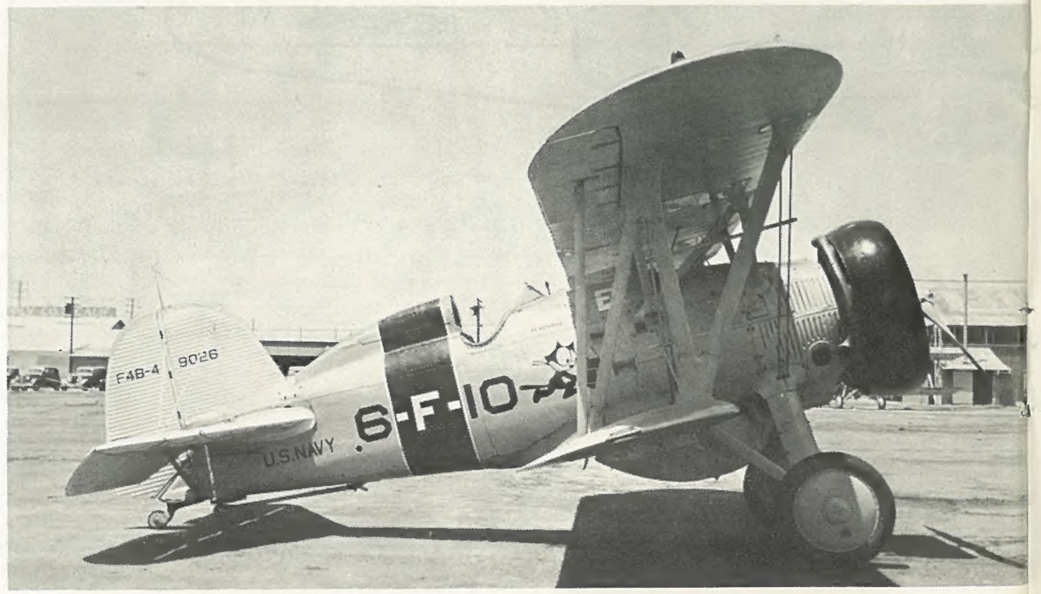


Air Corps P-12E had largest production of any model in the series.



The ultimate in Boeing biplane fighter development, the stubby little Navy F4B-4.

were the only two P-12 models that were not equipped with a speed-ring cowling.

The P-12B soon after made its appearance. It was a basic P-12 but having Frise balanced ailerons and new internal improvements. The P-12C and P-12D models were further improved models and utilized improved and heavier constructed cross-axle landing gear and also a speed ring cowl around 500 hp. P&W "Wasp" engine. Many P-12C and D models were fitted later with P-12E type vertical tail surfaces were found to give better control.

The entrance of the P-12E into the stable of U. S. Army Air Corps pursuits marked the beginning of a new era in pursuit aviation. Up until the development of the P-12E all previous U. S. Army Air Corps pursuits utilized fabric covered fuselages. The introduction of the all-metal monocoque fuselage in the P-12E made possible the following improvements:

1. Better pilot protection.
2. Fuselage streamlining.
3. Structural rigidity of the fuselage for higher "G" loads.
4. A better and more stable gun platform.
5. Less engine vibration.
6. Less fire danger from enemy gun fire.

The Boeing model 218 (XP-925H) was the prototype model in the P-12E—F4B-3 Series. Speed took a forward jump with these many innovations and the P-12E had a top speed of over 190 m.p.h., and had a service ceiling of 27,000 feet fully loaded, using a 500 hp. P&W "Wasp" engine. One P-12E was fitted with a special cockpit enclosure and others had "Panama Conversion Kits" installed.

The P-12F was an improved P-12E model with a 550 hp. "Wasp," it hit a top speed of 195 m.p.h. and could climb to 32,000 feet. The P-12F utilized a new swivel tail wheel in place of the conventional skid. All P-12's in service at that time were later fitted with tail wheels.

Other P-12 types which appeared after the P-12F model were mainly experimental test models. One XP-12G was produced having a turbo-supercharged "Wasp" engine driving a three bladed propeller. The XP-12H was a basic P-12D modified with a geared "Wasp" engine replacing the usual direct drive type. The P-12L and P-12J were further engine testing models. A number of P-12E's were modified for fuel-injection, and were designated P-12K's.

The trim little Boeing P-12's became known throughout the world and several countries patterned their designs from the basic P-12. Russia built a modified version of the P-12 which was used very effectively in Spain during the Spanish Civil War (1936-38). It was designated Russian I.5 Fighter and it formed the basic fighter strength of the Soviet Union for many years. The I.5 Fighter had a performance comparable to the P-12.

The Japanese imported a civil Boeing 100 model version, and certain features of the Nakajima A4N-1 Fighter bear a lineal resemblance to the Boeing fighter.

The P-12—F4B biplanes were favorites of pilots for many years, and they were our main source of pursuit defense in this country and abroad. They saw service in Panama, Hawaii, and the Philippine Islands. A few even found their way to China and one of these Chinese P-12's was the first American made plane to shoot down a Japanese aircraft in combat.

Two P-12E's, civil versions, were exported to Siam during the mid-1930's, and fourteen F4B-4's were exported to Brazil before World War II. A total of 554 airplanes in the Boeing P-12—F4B series were built. The largest number of any single type built was the P-12E, of which 110 were manufactured. The last P-12E in existence is on display in "The Air Museum," Claremont, California.

The U. S. Navy used this type quite extensively under the designation of Boeing F4B-1. This series ran through the F4B-2, and culminated with the F4B-4. These fighters were carrier based a good part of the time and were known from coast to coast. They were one of the most colorfully marked Navy aircraft in the world, and many will no doubt recall "Felix the Cat" and "High Hat" Squadrons participating in the colorful airshows of the 1930's.

The F4B-3 and P-12E were identical in outward appearance with the exception of the carrier hook, cabane wires, and double row of rivets, and a tall radio mast on the F4B-3. The F4B-4 was easily distinguished by its large vertical tail. Other differences being in headrest, exhaust, and left side engine panel changes. Exhaust collector rings replaced the earlier bayonet exhaust stacks. The F4B-4 continued to serve in the Navy up until 1941 where they were used as advanced fighter trainers. The U. S. Marines also used the Boeing F4B fighters and their familiar dive-bombing exploits became famous.

In 1939-40 a number of Boeing P-12E's were in use by U. S. Army Reserve Squadrons and in 1941 a number of these were turned over to the Navy for use as radio-control anti-aircraft targets for shipboard gunnery practice.

The Boeing XF6B-1 Fighter-Bomber had many F4B-4 features, however it was an advanced design study, and only one aircraft was built. It featured a P&W R-1535 "Twin Wasp Jr." engine of 650 hp.

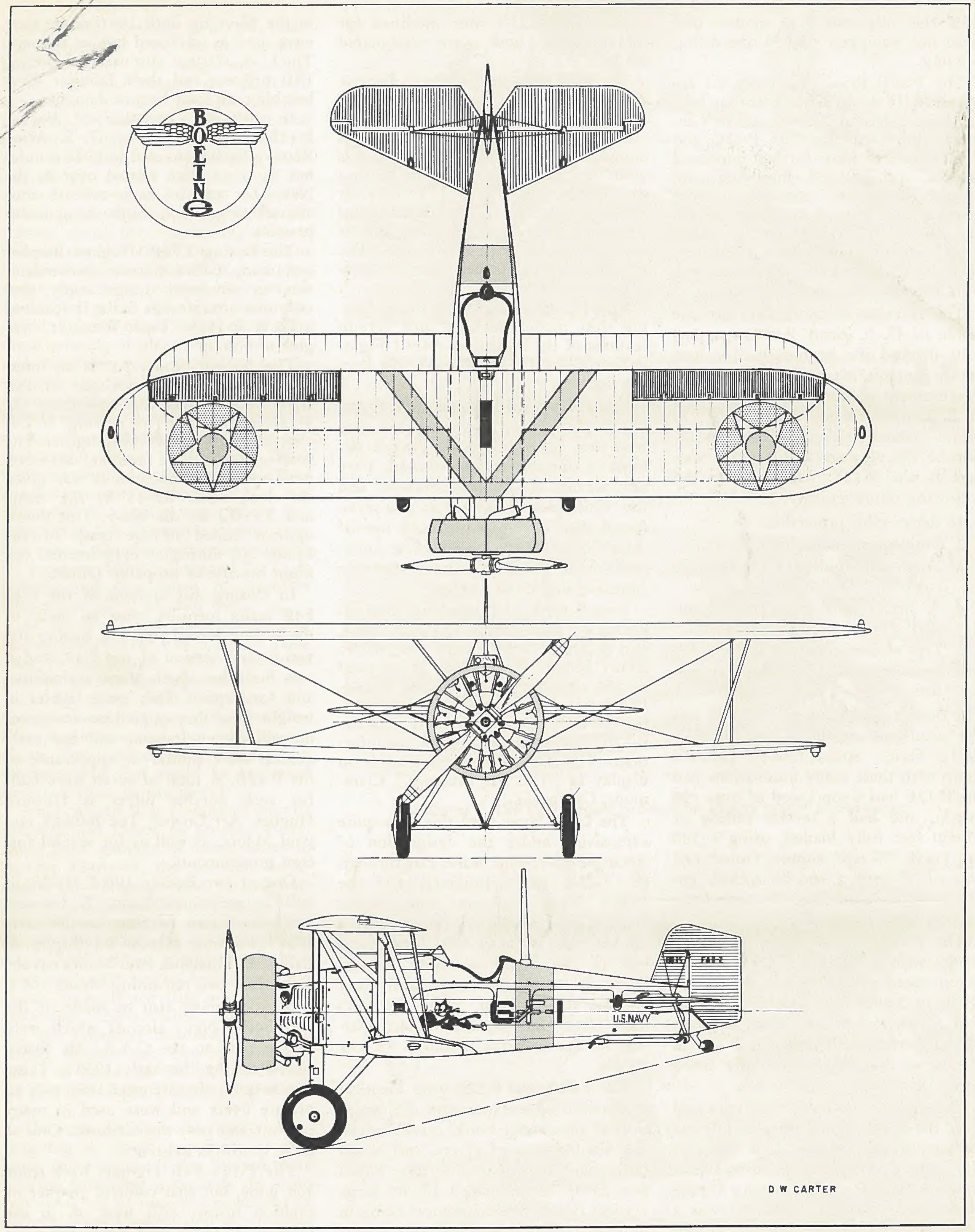
The Boeing Model 202 is an interesting and unusual sidelight to this series. The Model 202 resembled the P-12E without any lower ring. It was a strut braced parasol wing fighter. The fuselage was the familiar, all-metal monocoque construction. It was given the designation XP-15 by the Army and XF5B-1 by the Navy. This development ended in the crash of the Model 202 during an experimental test flight because of propeller failure.

In closing this account of the P-12 F4B series mention must be made of the Boeing Model 100. The Boeing 100 was a civil version of the P-12, and it was built for sport plane enthusiasts, and for export. They were lighter in weight since they carried no armament or military equipment, and the early models were similar in appearance to the P-12B. A total of seven were built for such notable pilots as Howard Hughes, Art Goebel, Tex Rankin, and Paul Mantz, as well as for several foreign governments.

One of two Boeing 100 E Models is still in existence. Both "E" models made were sent to Siam in the early 1930's and one is now on display at Bangkok, Thialand. Paul Mantz has the only other two remaining Model 100's.

Mention must also be made of the two F4B-4 Navy aircraft which were turned over to the C.A.A. Air Safety Board during the early 1930's. These two veteran aircraft were later sold to private fiyers and were used in many pre-war and post-war airshows. One of these is still in existence.

The P-12—F4B Fighters have come and gone, but that colorful chapter of aviation history still lives on in the memory of those who remember these colorful little fighters of the 1930's at the National Air Shows, and of the many service pilots who flew them.



D W CARTER

Boeing F4B-2 — Three View

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